COAL

A McGRAW-HILL PUBLICATION

APRIL, 1960

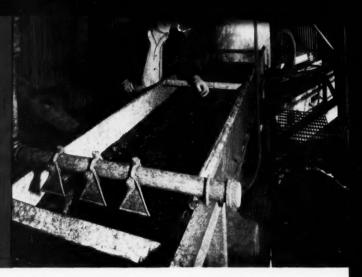
PRICE \$1

Continuous Transport In Thin Seam . . . p 72

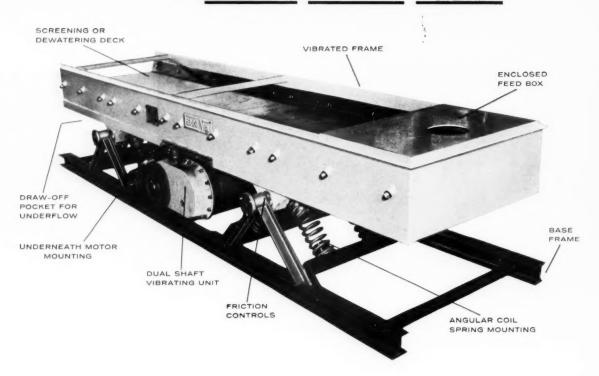
New Shoyel King..

115 Gu Yd . . . p 28

SHAKE OUT High Production Costs with ECCOVIB VIBRATING CONVEYORS



with <u>Dual-Shaft Vibration</u> for positive Material Control



An exclusive dual-shaft vibrating mechanism with splash oil lubricating system sets up the **LECCOVIT** vibrating conveyor for efficient and economical screening, dewatering, conveying and feeding in one positive motion . . . allows for fast, easy adjustment of angle

of material lift \dots assures high capacity, low maintenance operation.

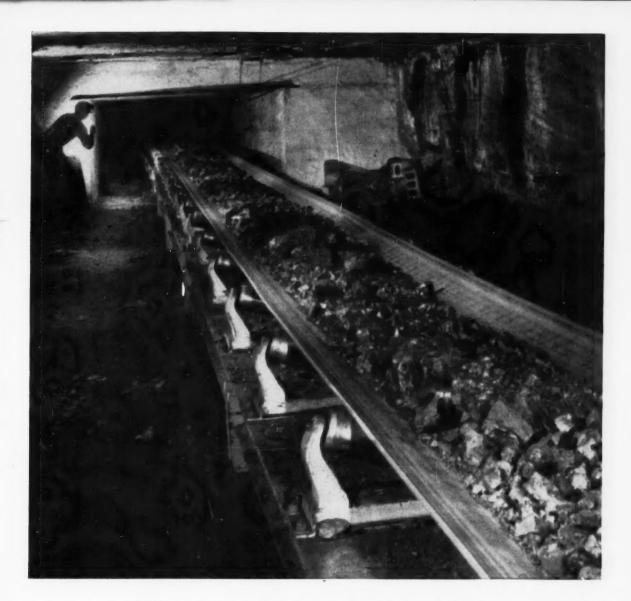
Friction controls and angular coil spring mountings of the LECCVIE conveyor confine vibration to vibrated frame . . . eliminates heavy support structure and tie-down bolts . . . requires minimum space . . . and even enables its use as a portable unit.

For complete information about the **LECCOVIE** vibrating conveyor, write for illustrated bulletin No. 5602.

Lecco Machinery and Engineering Co.

BLUEFIELD, WEST VIRGINIA

Subsidiary Fairmont Machinery Company



Mine gets added safety at no sacrifice in belt life

OPERATORS of this West Virginia mine figure the belt pictured above is saving them \$5400 a year. It's a B.F.Goodrich belt made with fire-resisting rubber. Because this belt won't support combustion or spread fire, ventilation stoppings are not required in the cross ducts along the belt line. The mine owners estimate that they save the cost of 60 such walls a year at \$90 each.

In addition to this saving, engineers expect the belt to at least equal—and probably surpass—the long service records made by other B.F.

Goodrich Caricoal belts in underground mines. That's because the special fire-resisting rubber used in the belt also has high resistance to oil, grease, acid water—and the cutting, gouging and impact of coal.

As you can see, the BFG belt troughs well, too. Because it's so flexible, it can carry coal at high speed without spilling a lot of it along the way.

Before you buy another conveyor belt, look into the safety and other cost-cutting advantages you can get with B.F.Goodrich fire-resisting belts. They've been accepted for listing as fire-resistant by The Bureau of Mines (Acceptance No. 28-6). Your B.F. Goodrich distributor can give you details, or write B.F. Goodrich Industrial Products Co., Dept. M-817, Akron 18. Ohio.



144

IN ELEVEN MONTHS

This big McCarthy Auger mined 144,292 tons in eleven months in east Kentucky. That's bigger tonnage than many 100-man underground operations produce. And it was done with a two-man drilling crew!

Two big facts loom large in tonnage like this:

RUGGED CONSTRUCTION AND OUTSTAND-ING DESIGN which hold downtime to a minimum. . .

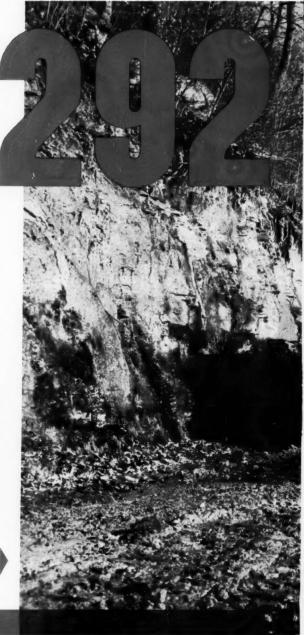
HYDRAULIC JACKS AND SKIDS which move the auger from hole to hole. No need to wait for the 'dozer.

The only time drilling slowed up was when haulage roads became impassable. The big drill works under almost "swamped" pit conditions. Pits can be as narrow as 30 feet. Highwalls can curve in or out. Coal of any density can be drilled with ease. Recovery rate is the best in the field!

If you'd like FACTS and FIGURES on the cost of augering, with a McCarthy, write directly to us or contact your nearest Salem distributor. Initial investment is less; pitto-pit moves faster; set-up quicker. What's more ... you can switch auger sizes at no added investment.

Add it up . . . augered coal costs less with a McCarthy!

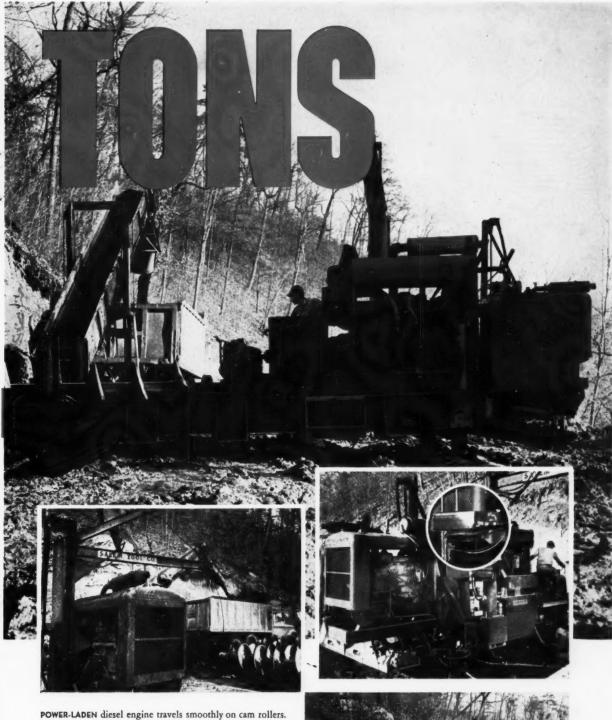
RUGGED AUGER works tight against the face. Operator can see entire highwall and observe rapid flow of coal. Only two-man crew required.





5 A L E TOOL COMPANY

763 SOUTH ELLSWORTH AVE. . SALEM, OHIO



POWER-LADEN diesel engine travels smoothly on cam rollers. Advance and return are fast. Side boom has hydraulic lift and swing. Drill has low center of gravity. (ABOVE)

MODERN AUGER MINES utilize two-way radio. Big tonnages made possible by powerful McCarthys have boosted auger mining into big tonnage, high-profit class. (TOP RIGHT)

EXTENDED SKIDS smoothly position drill without 'dozer help even in sloppiest pits. Auger moves forward, back or to either side under own power. (RIGHT)





These figures add up to big savings in coal dewatering for

Here's what one user of Bird-Humboldt Centrifugal Coal Dryers reports:

INCH stoker size coal is dewatered without degradation

PER CENT surface moisture or less; eliminating costly thermal drying

99.

PER CENT solids recovery over the entire long life of the screen

TONS PER HOUR CAPACITY

75.

HOURS average screen operating life; contrast this with the daily or weekly screen replacement in ordinary screen centrifugals

3000.

KWH power input per ton of dewatered coal

0.2

*Many other preparation plants are putting finer sizes through the Bird-Humboldt with equally money-saving results



BIRD-HUMBOLDT **Oscillating Screen** CENTRIFUGAL COAL DRYER

SOUTH WALPOLE, MASSACHUSETTS

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APRIL. 1960

1

This Month in COAL

Features This Month:

Editorial: Gas Competition p 71
Continuous Transportation in Special Mine Layout
Paces High Productivity p 72
Acid-Drainage Curbs Are Here p 80
50 Biggest Bituminous Mines p 86
AC for Underground — Systems Evaluation And
Selection p 92
PVC Woven-Nylon Belts p 100
Operating Guide: Coal Screens and Screening p 107
Stripping Coal Under a Lake p 126
Maintenance Ideas: 24 Maintenance Tips p 130
Thin-Seam Conveyor Mining Under Weak Roof p 136
AMC Coal Convention Program p 142

Departments This Month:

Coal Commentator	. p	11	News Rou	ndup	p	26
Foremen's Forum	p	146	Operating	Ideas	p	152
Equipmen	. 1	Develo	nments	n 158		

On The Cover-This gigantic machine, the world's largest self-mobile land vehicle, is a 115-cu yd shovel now being built for Peabody Coal Co. by Bucyrus-Erie Co. A full description of the machine appears on p 28 in News Roundup.

► Thin-Seam Mining

Continuous Transportation in Special Mine Layout Paces High Productivity p 72

Peak production of 550 tons per shift in rooms and 483 tons in entry development by 8-man crews in 36-in coal result from application of "Full Dimension" bridge-conveyor mining at Cedar Creek Mining Co., Otsego, W. Va. Management credits these results to the following:

- 1. Application of high-capacity equipment designed for continuous loading.
 - 2. A mining system tailored to equipment.
- 3. Skilled machine operators who can handle several machines equally well.

Round-the-clock preparation provides enough coal for continuous loading on two productions shifts. The continuous loading and conveying equipment includes: Long 188 loader; 40-ft Piggyback; Mobile Bridge Carrier; second 40-ft Piggyback; and a 120-ft chain conveyor feeding a 30-in Lo-Rope belt.

Featured-Mining plans, loading sequences, loader maneuvers.

Stream Pollution

Acid-Drainage Curbs Are Here p 80

W. A. Raleigh Jr., Associate Editor, Coal Age

In adopting "Resolution 5-60" Jan. 14, 1960, the Ohio River Valley Water Sanitation Commission and its Coal Industry Advisory Committee compromised long-standing differences on initial acid-drainage controls. Preliminaries to enforcement are already underway. Still ahead: Final solutions to the problem; extending curbs to other types of discharges.

Part of the Package—Tributes to Henry Hebley; review of present acid-control practice; proposed action program; CIAC members.

► AC Power

AC for Underground—Systems Evaluation and Selection 92

Otis G. Stewart, Executive Engineer - Mining, Union Carbide Metals Co.

Increased safety, increased economy and greater reliability are major AC advantages and were the reasons for embarking on the design of a system in the 30s. It was installed in the early 40s to supply hand-loaded conveyors and auxiliaries, retaining DC for locomotive haulage. Service was through SH-D cables (5,000 V) carrying 2,400 V to 2,400/440/220-V transformers with delta-connected secondaries. With a change to loading machines cable voltage was raised to 4,160 and, in a new property in an upper seam, belts permitted operation with only AC underground. With only minor modifications, the system as now set up will take care of continuous miners when they are intro-

And Important-The two basic requirements for successful AC operation underground.

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▶ Conveyor Belts

PVC Woven-Nylon Beltsp 100

Not until recently has the mining industry been able to select conveyor belting employing different types of material and construction. How these belts have performed for those companies that are using them are included in this first field report.

Special—Five companies tell of their experience with PVC woven-nylon belts.

▶ Operating Guide

Coal Screens and Screening p 107

Almost all of the half-billion-ton stream of material annually produced by the Nation's coal mines passes over one or more screens on its way to the ultimate consumer. Every operator of screening equipment owes it to himself, in the interest of higher efficiency and lower costs, to study his screening operations, keep records and experiment with machinery and screening surfaces. This 16-p Operating Guide deals with screen functions, such as conditioning and sizing, screening equipment and its special uses, screen installation and feeding methods and maintenance for maximum efficiency.

Bonus—Buyers' guide lists suppliers of machines and screen panels for use in coal-preparation plants.

Stripping

Stripping Coal Under A Lake p 126

New Zealand earthmovers shift a lake and remove lake-bottom silt by dredging and pumping the solids and water behind dikes. Natural overburden then is removed in a loading-hauling operation to expose a thick seam of coal that has been deep-mined in the past. Coal recovery operations are carried on in dewatered, desilted areas while the dredge prepares the next mining site.

Spotlight—Aerial plan view of concurrent stripping and dredging.

► Maintenance Ideas

24 Maintenance Tips p 130

Information in this feature is tuned to the problems and interests of maintenance groups. Twenty-four maintenance tips have been selected and written for quick reading. They might possibly relieve maintenance personnel of some of the strain of every-day problems so that more time can be devoted to improving maintenance practices.

Feature-New ideas and products.

This Month in COAL

SLOW GOING—In part because of weather, which interfered with production at bituminous mines and (by being warmer than normal) cut fuel demand in anthracite-burning territory, results in the first quarter of 1960 in both industries could be best summed up by "Slow going." Bituminous output was slightly under 1959, and anthracite considerably under.

Weather was only part of the answer in the case of bituminous. The big item was a less-than-expected pace for automobiles, steel and other business. In other words, while things were good they weren't booming. This probably will be the picture for the next quarter, though a strengthening trend should become more evident as time goes on. A stepping up in the coal pace therefore is in the cards.

FARTHER AHEAD—The absence of boom conditions, even though business is good, is prompting more-than-usual scanning of future prospects. One leading economic organization, taking cognizance of this extra interest in future developments, has analyzed the past and future of the growth curve. Conclusion? In contrast to the inferior growth rate of 3% per year in gross national product from about 1956 to now, this organization sees an acceleration to 5% or better starting about 1964. This would compare to the rate in the 1947-55 period, which was an active period indeed.

IN CONGRESS—Two of the major matters coal is pressing in Congress are a fuels policy and a revision in income taxes. What are their chances? There is sufficient interest in the matter of a fuels policy to probably result in debate in the Senate. Interest is less in the House. Consequently, on balance, passage of a resolution for a study committee is less than a sure thing. As for tax reform, here again, though reform is admittedly necessary, not too much can be expected, since progress in this area is historically slow.

UP AGAIN FOR UTILITIES—The electric utilities continue to push up their installed capacity, over two-thirds of which will burn coal. Capability in 1959 was 156,622 MW. Additions in 1960, 61 and 62 will increase it over 35,000 MW, or over 22%. After 1962, an additional 23,000 MW already is scheduled, or another 15%. In firm prospect, therefore, to 40 million tons of additional business assuming coal fuels no more than its present two-thirds. All producing regions will share at least to some extent, witness the recent announcement that Kentucky Power Co. will build a 750,000-tons-a-year plant in eastern Kentucky.

CHEMICALS, CARBON AND GAS—Developments so far in 1960 indicate that "Soaring Sixties" may usher in a new era of coal use for chemicals, carbon, gas and liquid fuels. In addition to the coal companies and outside concerns that have announced projects so far, a number of others may be expected in the near future. The Lurgi process and modifications thereof is in the running with charring and other processes. In the Buck Rogers class is a new nuclear reactor, nicknamed "The Turret," which Los Alamos staffers are building for various applications, including turning coal into gas and gasoline. Operation date? Spring of 1962.

engine power by caterpillar

FACTS ON REPOWERING WITH CAT ENGINES

Obsolescence has a way of creeping up almost unnoticed on equipment like industrial locomotives. One reason is that you buy equipment like this with long-term use in mind. So long as it performs reasonably well, an industrial locomotive seems ageless.

Yet, age does take its toll in efficiency. The locomotive needs more care and parts. It's slower on round trips. Down time occurs more frequently. It just isn't as reliable as it once was.

In some instances, the job grows beyond the locomotive's capacity. When the job is just slightly bigger than the engine, it's economically hard to warrant the cost of a new unit to get ahead. Many owners of industrial locomotives have found an answer to the age problem that's economically sound and sensible, too, from the production standpoint. They've simply repowered with Caterpillar Diesel Engines. For a modest investment—compared to costly maintenance or to buying a new locomotive—they now have locomotives that perform better than new.

A sand and gravel producer repowered a Plymouth locomotive with a Cat D337 and was able to do away with a steam locomotive he purchased from scrap to keep materials moving. The repowered 45-ton engine, reports the company, can break away and haul greater tonnage than the 60-ton steam locomotive. When the Plymouth had an air-operated clutch (direct drive), it was a major headache . . . big loads were clutching and declutching nightmares. Clutches wore out fast. Engine repairs were high and even the rails wore out rapidly. Efficiency was low.

In another instance, the owner of a 25-ton locomotive crane replaced a gasoline engine with a Caterpillar Diesel. This changeover has proved to be a very practical installation. Power and economy are good. In addition, the simplicity of the installation and the low cost of the changeover were added advantages gained by this owner.

Cat Diesels prove themselves in changeovers from every kind of power—including steam. A 15-ton locomotive crane, powered by steam, was changed to a Cat D315 with Torque Converter. The engine has more than ample power reserve for work—and the power is far smoother than that obtained with steam. The crane's work output shot up 33%—and the cost of diesel fuel is a small fraction of the cost of boiler fuel. And no fireman is needed with the diesel installation.

We could cite an almost endless list of examples. In each case, the equipment owner made the changeover on the basis of careful evaluation of every repowering aspect. In every case, Caterpillar Diesel Engines proved to be the best repowering investment. Post-installation performance justifies the choice down the line. Output goes up. Operating costs go down. Costly maintenance vanishes and dependability rises to new highs. And all of this comes with an investment that's only a fraction of that for purchasing new equipment to replace the entire unit.

When you think of repowering, be sure to have your Caterpillar Dealer give you his recommendations. He probably has repowered locomotives or cranes like yours. He can give you a clear idea of the cost and of the results you can expect. Probably, too, he can show you how to save a good deal of money. He has dependable Caterpillar Diesel Engines from 50 to over 700 HP, in a choice of many configurations. He is able to match the engine and transmission precisely to your need.

Send for "Caterpillar Engines for Railroad Power" and for "Railroad Equipment Manufacturer's Machines Powered by Cat Diesels." Each contains power data that can help you work out the best answer to your engine needs. Send for these today.

CATERPILLAR

► Conveyor Mining

Bad roof and 32-in coal are two challenges facing management every day at Laddie Coal & Mining Co., Robbins, Tenn. Relying on close teamwork among face crews and strict adherence to timbering standards, the company successfully mines a premium domestic product with conveyors. Mining is in the Glen Mary seam which analyzes 3 to 4% ash, 0.73% sulphur and 14,536 Btu dry. Mining plans feature two-stage development of seven-heading mains, and 40-ft faces in room development and pillar extraction.

Extra-Details of the face cycle.

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This Month

in

Mining Practice

HUNDRED PLUS—Forecasts of the building of a shovel with a 100-cu yd or larger dipper have now become a reality with the announcement of the 115-yd machine contracted for by Peabody for its Paradise property in Kentucky. An artist's conception of the unit at work appears on the front cover of this issue. The fact that it will be built is evidence that the possibilities of bigger, heavier, higher-capacity and more-costly equipment still will provide the requisite payoff when conditions are right. Perhaps now the thing to do is to speculate on the coming of the 150-yd unit, which may not be too far off since stripping continues to increase its percentage of the total output as a result of developments such as these.

OTHER HUNDREDS—Along with 100-yd shovels should come the 100-ton or better haulage unit, which also has been the object of design studies for some time. Draglines probably never will swing 100-yd buckets, though this is not an impossibility. However, 50- or 60-yd buckets, with ranges to match, may be just around the corner in the stripping business.

Also in Deep Mining—One hundred may be the major figure in underground operation also. In fact, 100 tons per day per faceman is seen as becoming fairly common even with conventional units, while the goal probably should be that or better with most continuous units in reasonably thick coal with average conditions, with corresponding goals for the thinner measures.

AND STRIP AUXILIARIES—As size and capacity of primary units increase, size and capacity of auxiliary units likewise rise. In overburden drills, for example, a new high-capacity vertical rig is mounted on a turntable for greater efficiency and versatility. A parallel development in horizontal drilling is a double-headed unit for two holes per setting. Perhaps the vertical turntable machine may eventually carry more than one drilling unit also.

And when it comes to the smaller, though not necessarily less important details, buckets are undergoing further study, with the result that one organization is rounding the corners and installing extra teeth there, in addition to lengthening all teeth for faster digging. To improve the rate still further, a step plate is installed back of the lip to chute the dirt to the back faster.

UNDERGROUND AIDS—New developments in various phases of underground operation include, for example, experiments in feeding water through the augers in coal drilling for dust suppression. Meanwhile more extensive experience and wider use are confirming the benefits of through-the-steel dedusting in roof drilling. Then there is haulage. In the rail type, attention to what seemingly are minor details are paying dividends. Frozen-wheel and bent-axle detectors, along with flange oilers and other steps save operating and maintenance money. And a year and a half's experience with 10 big aluminum cars seems to indicate that this metal will become a major contender shortly.

WIDE RANGE OF SIZES THROUGH 10"! ALLOY OR RUBBER COVERED PARTS! HIGH HEAD APPLICATIONS!



There is a Wilfley Sand Pump to meet your specific requirements in the transfer of solids. Wilfley's wide range of sizes, capacities, and interchangeable parts give you versatility in the handling of sands, slimes, sludges, slurries – abrasives of all types.

Whether you need belt driven, overhead V-belt driven, or direct driven sand pumps, Wilfley has them. Wilfley Sand Pumps guarantee lower pumping costs, higher output and maintenance-free service. Write, wire or phone for complete details.

Every installation is job engineered for maximum pumping economy.

A. R. WILFLEY and SONS, INC.

The Coal Commentator

Good News

The 1959 fatality rate for bituminous was 0.60 per million tons (preliminary figures). In January, 1960, the industry achieved a rate of 0.33 per million tons, based on 12 fatalities and a total production slightly ahead of January, 1959.

This is good news, in spite of the Island Creek fire in March, because it shows that coal can achieve low rates—lower even than 0.33. Over half the underground fatalities were a result of roof falls, which is continued evidence that the final solution or solutions of this problem have not been found—nor to haulage accidents, which still rank second as a cause of deaths in mining.

The 1960 Roof-Fall Campaign is aimed at what is still the big killer. If you are not participating, may your Commentator urge that you enrol and bear down. To the personal satisfaction of saving life and injury you can add a significant money saving in the form of reduced compensation, fewer production losses and less outlay for cleanup and repair of damage to plant and equipment.

Panther Valley End?

Lansford—The whistle blew here on a coal mine and onetime multimillion-dollar industry. The long, loud blast closed—perhaps forever—the Coaldale colliery on the outskirts of this Panther Valley community—Sunday Independent, March 6, 1960.

This footnote on the possible demise of what was once an important segment of a flourishing anthracite industry stands in sharp contrast to announcement of plans for the bicentennial of the bituminous industry, scheduled for Richmond, Va., June 17-18. The main causes of this demise originate primarily in the rise of oil and gas.

Whatever the reasons each new stage in the decline of anthracite brings its pang. But though the ultimate is still unknown, courage and cooperation by management, men and public still could keep the industry as a significant source of energy and contributor to the welfare of its area. The whistle then would blow for work, not its cessation—and perhaps the end would not have come for Panther Valley after all.

Within and Without

Fish, frogs, flowers, forage, grapes and honey, along with trees and fruit, are among the products of strip reclamation. Now Maryland comes up with a new use for old strip cuts—a cheap and convenient place for garbage disposal.

Placed in old cuts or in trenches in the spoil, the garbage is covered to the required depth by bulldozer. In other words, the process is a form of sanitary land fill-long accepted as a good method of disposing of community waste.

Though not, perhaps, earth-shaking, this development still ranks as a good one—and as further evidence of the payoff flowing out of study and ingenuity not only within coal but without. And the ways coal can help people in these modern days continue to expand.

Northern Climes, Too

From the Southwest to the Northeast electric heating continues to grow-and in other regions as well.

Recent examples of electric heating—home and otherwise—include the new office building of the Pittsburg & Midway Coal Co., at Pittsburg, Kan., where a heat pump has shown its ability to provide comfort and convenience at low cost. Moving to the Northeast, the 1959 annual report of the Western Massachusetts Cos. features their electric spaceheating campaign. Offices, other commercial properties and homes, particularly the latter, are targets—and are buying.

Developments such as these—and the action of the British Columbia Electric Co. which, though in oil and gas territory in western Canada, and the possible recipient of substantial hydro rights, recently bought a coal company and its reserves—are continued evidence that coal can do a job no other fuel can, and thus is in line for better things in the days to come.

Roy Campbell

March 23, at the Duquesne Club in Pittsburgh, Roy Campbell was the special guest of *Coal Age* and *Engineering and Mining Journal*. The event was one of several marking his retirement from the post of director of advertising for the Joy Mfg. Co.

Roy originally was one of the able group that made the Sullivan Machinery Co. an outstanding builder of machines and equipment for all types of mining. When it was acquired by Joy his qualifications and experience made it logical for him to take over the same job in the larger venture which, incidentally, is still growing and expanding through quality and service. His was the task of facilitating communication with actual and potential customers to the end that they would benefit to the maximum from the research, engineering and manufacturing accomplishments of his company.

When one considers it, this is no unimportant task. And when one discharges it most capably and at the same time in a manner to win the respect and affection of all who came in contact with him, he is entitled the fullest of honors, along with the best of all wishes for the future.



HOYT Recommendations Improve Screening Efficiency In Sizing and Dewatering Coal

Because coal itself is not abrasive, most producers have considered plain or spring grade steel to be satisfactory for their wire screens. However, in today's more efficient, continuous mining operations a larger percentage of the feed which passes over the screens is rock, much of which is highly abrasive. And today, screens are required to handle a vastly increased volume tonnage.

Why New Wire Specifications?

For these two basic reasons, HOYT has proven that "dead" screens of plain or spring grade wire are no longer the best buy for dry sizing. In later installations, we have recommended "live" high tensile, high abrasion resistant, oil tempered SUPERTOUGH wire. In washing and dewatering operations, acid and water corrosion was taking its toll of screening efficiency and wear life. Here HOYT recommended a change to spring grade stainless steel, type 302 or 304, as most suitable for wet applications. In plant after plant where these recommendations have been followed, increased efficiency and reduced screening costs have resulted.

What Type Screen 1s Most Efficient?

It has been the experience of most producers that there are few or no problems with openings ½" square or larger. Smaller than that, it is most important to get maximum open area consistent with sizing requirements. It has been found that Longslot specifications with medium heavy wire diameter afford maximum open area and efficiency. Next most effective is the Oblong Space type with medium or light wire diameter. Least desirable in regard to open area is the square opening. For example: 3/16 x 3" Longslot construction, .105 dia wire, affords 57.4%

How HOYT Improves LONGSLOT Efficiency

.080 dia wire, only 49.1% open area.

open area. By comparison, 3/16 x 1/2" Oblong Space construction, .105 dia wire, affords 51.5% open area, and 3/16" square opening, with a light

HOYT uses full spring grade stainless steel with a hardness and tensile strength comparable to SUPERTOUGH. It has the ability to carry and amplify vibrations imparted by the screening mechanism (a principal reason why long openings should always parallel the clamping width). This enables the longitudinal wires to free themselves of material that would otherwise adhere.

2. In HOYT Longslot construction, clusters are crimped Smoothtop so that there are no knuckles to prevent a free flow of material across the screen deck.

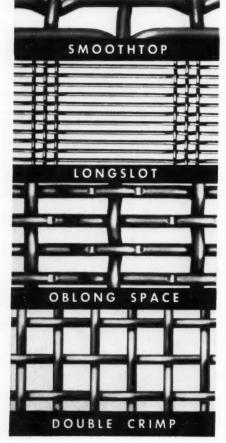
3. Blinding or plugging normally occur in the clusters. If the location of solid bucker-up bars is known, in most instances the clusters can be spaced so that they fall over the bars. It is frequently possible to increase open area 3 or 4 percent by following this procedure.

4. In most vibrating screens 5 ft. or wider, a center hold-down bar is standard. When it is necessary to cut holes in the wire screen to permit passage of hold-down bolts, a weak spot results and the line of vibration waves is interrupted. To avoid these effects, we braze a washer to the cut screen to accommodate the bolt.

Survey Important To Maximum Screening Efficiency

To make the above and similar recommendations for improving your screening efficiency, we suggest a survey of your present equipment. HOYT representatives have made surveys in all major coal producing areas.

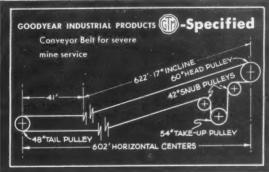
Periodical revisions keep the surveys up to date. Your request will bring a HOYT representative to discuss a survey of your plant at your convenience.





How do you get the coal out of a rich, new mine—at the lowest cost and with the fewest problems over the long haul? That was the problem this mine's management tossed at a top conveyor belt expert, the G.T.M.—Goodyear Technical Man—about 9 years ago. So, after a careful study of particular mine conditions, he made his recommendation: super-tough, abrasion-resistant STACKER GRADE Belting for a 622-foot slope. How well did this recommendation stand up? Although the G.T.M.'s belt operates under very wet conditions—carries large chunks of coal and slate to the cleaning plant—it had handled 50 million tons of r.o.m. coal at last report. Service-life had been without problems. What's more, a searching check showed it good for additional millions of tons.







When you can't afford to gamble on anything but the best—in belts or any other industrial rubber product—check with an expert, the G.T.M.

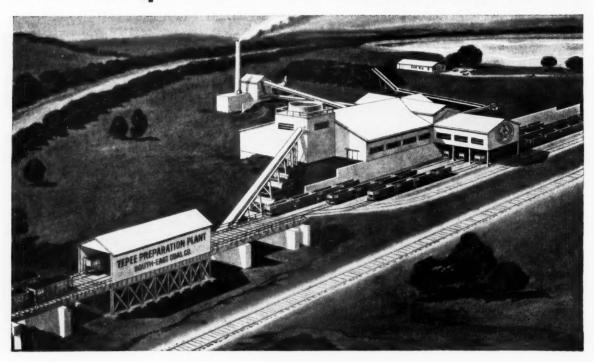
Your Goodyear Distributor can arrange a G.T. M. visit anywhere—any time—in short order. He's also your man for the finest in V-Belt, Hose, Flat Belts and other products. You'll find your distributor's name and number under "Rubber Goods" or "Rubber Products" in the Yellow Pages. Or write Goodyear, Industrial Products Division, Akron 16, Ohio.

THE BIG NAME IN CONVEYOR BELTS:



THE GREATEST NAME IN RUBBER

a new concept in COAL PREPARATION PLANT DESIGN



Artist's view of the new 900 TPH Coal Preparation Plant for South-East Coal Company, Irvine, Kentucky

In close cooperation with the Kentucky Engineering and Materials Company, prime contractors for the South-East Coal Company, Heyl & Patterson is executing plant lay-out and design engineering for the Fine Coal Preparation and Water Clarification Plants, based on H & P's flow sheets.

Heyl & Patterson was entrusted with this role on the strength of its pioneering in new and improved coal preparation methods and because it has developed the equipment necessary for these better practices.

The unique split-level design of South-East Coal Company's new coal preparation plant utilizes the topography to achieve substantial savings in excavation and foundation costs.

When it is completed, this plant will process

900 TPH of 6" x 0 coal with equipment selected for economy and performance. Much of this equipment is the product of Heyl & Patterson's research program for the development of advanced coal preparation machinery and processes. For instance, the H & P Fluid Bed Dryer in this installation is the largest single unit thermal dryer ever built

Discuss your new coal preparation requirements with H & P engineers who will gladly assist in an earnest search for solutions best suited to your own operating and marketing conditions.

Depending on your needs, you will receive from us a proposal either for a "turn-key" job or a cooperative effort, similar to the one proving so successful for the South-East Coal Co.

When experience counts . . . count on Heyl & Patterson.

HEYL & PATTERSON, inc.

55 FORT PITT BLVD., PITTSBURGH 22, PA.





Wells Overseas, Ltd., an associated company of Wells Cargo, Inc., Reno, Nevado, is using 16 KW-Dart 802-AT Tractors equipped with Fuller R-1160 ROADRANGER Transmissions in iron mining operations 250 miles south of Lima, Peru.

Geared with FULLER ROADRANGERS

...91-TON LOADS

with double bottoms...

Featuring 9-speed Fuller R-1160 ROADRANGER Transmissions, 16 KW-Dart 802-AT Tractors handle up to 91 tons of iron ore at a time on a mining operation in Peru.

Owned by Wells Overseas, Ltd., the 320 hp KW-Darts use the singlestick, semi-automatic ROADRANGERS to provide maximum performance on the cross-country haul from crusher to the seaport of San Juan. Because the diesel engines can operate in the peak torque and hp range at all times, the 72-mile round trip is made in 3½ hours, including time for loading and unloading.

Ask about the Fuller Transmission designed to boost your profits.

STANDARD EQUIPMENT

on Fuller Off-Highway Transmissions

- COUNTERSHAFT INERTIA BRAKE...
 for quick, easy upshifts without double clutching . . . faster work
 cycles
- PRESSURE LUBRICATION and FIL-TRATION SYSTEM . . . for longer gear and bearing life . . . greater availability, less maintenance

FULLER

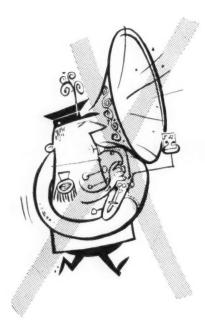
MANUFACTURING COMPANY
KALAMAZOO, MICHIGAN



Subsidiary EATON Manufacturing Company

Unit Drop Forge Div., Milwaukeo 1, Wis. * Shuler Azle Co., Louisville, Ky. (Subsidiary) * Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla.

Automotive Products Company, Ltd., Brack House, Langhum Street, London W.1, England, European Representative



There isn't much fanfare about BOWDIL announcements...

Any new development is so thoroughly mine-tested for such a long time that practically everybody knows what we're up to.

When certain the product is right, we talk about it. This is not just modesty . . . it's our policy.

Here are 3 new developments to help you cut costs, meet modern demands more economically, improve production and most important . . . your profits.

1 New "THIN-KERF" CUTTER CHAIN



Proving very popular in money-making operations of Virginia and W. Virginia coal fields. It lends itself best to use on machines delivering up to 15 h.p. and kerf of 3" to 3 ½". Reduces amount of cutting to the point where higher feed speeds are realized . . .

and CLEANER CUTS!

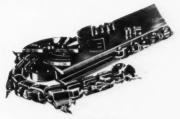
Example:

The much-in-demand new "compact" mining machines are featuring the new "Thin-Kerf" Chain and Bar, with Bowdil Bits & Sprockets.

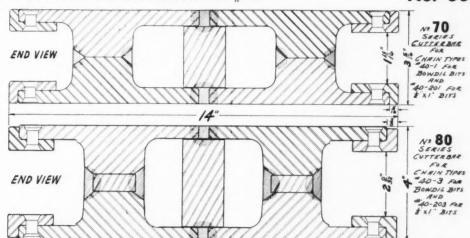


2 New SUPER-STRONG CUTTERBAR

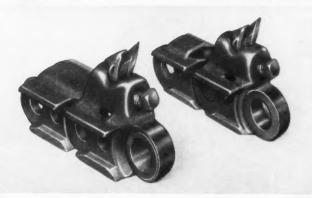
Now being built to fit all of the newest heavy-duty machines. The Series #80 has been beefed up proportionately greater overall to meet the demands of such machines, (including heavier wearing strips and rivets), is designed for use of the stronger new Bowdil Chain and Sprockets. Compare dimensions of the new #80 with standard Bowdil Bar #70.



SERIES No. 80



Heavy-Duty BOWDIL CHAIN #40-3 ALSO USED ON CONTINUOUS MINING MACHINES





COMPANY

Both views show #40-3 at left, standard Bowdil Chain (#40-1) at right. Photos used for comparison illustrate the rugged strength of the new #40-3.

All items are in full production with prompt delivery.

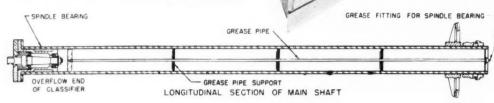
Your inquiry is invited . . . we'd like to hear from you. Phone GLendale 6-7176

Large working pool area in **AKINS COAL CLASSIFIERS**

gives lower cost

- DEWATERING
- SIZE SEPARATION

Other Exclusive Akins Features



SUBMERGED BEARING

The patented submerged bearing has proven its advantages of durability, trouble-free operation, and ease of maintenance.

The submerged bearing is grease-gun lubricated through a pipe in the main shaft; thus the pipe is isolated from tank contents and protected against breakage. Grease fitting is at upper end of shaft for maximum convenience.



MECHANICAL LIFTING MECHANISM

The lifting device consists of chains, chain sprocket sheaves, and motor-driven or handoperated reducer unit. Experience has proven this mechanical arrangement to be the most positive, with no possi-

bility of slippage. Minimum maintenance. No packing glands or rods to become worn.

> to give you the best!



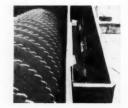
TANK SUPPORTS

SPIRAL PITCH

50 years of experience has shown that the half-diameter pitch gives maximum raking capacity and results in less slippage and less wear than advanced pitch spirals.

WEARING SHOES

Wearing shoes are made of various alloys, including Climax 42-A. Patented serrated wearing shoes are available for special applications. Special inner shoes are provided for heavy rake loads.



The bevel gear, V-belt drive has proven to be the most trouble-free and flexible. It permits mounting the motor, or motor-reducer, horizontally; and changing speeds quickly and inexpensively, by simply changing V-belt sheave ratio.

Web beam substructure supports

tank. There's no load to be carried

by tank. This also reduces installa-

tion cost by eliminating need for extra sub-structures to support tank.





The Company

Manufacturing Division

AND SMELTER

Licensed Manufacturers and Sales Agents in Canada, Australia, Sweden, England, South Africa Sales Agents in Peru, Chile, Philippine Islands, Japan, New York City (for Continental Europe) and in principal cities of the United States,



TAKES OFF
ITS HAT
TO NOBODY!



Lag, machine, and carriage bolts. All sizes. Quick delivery from stock.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL



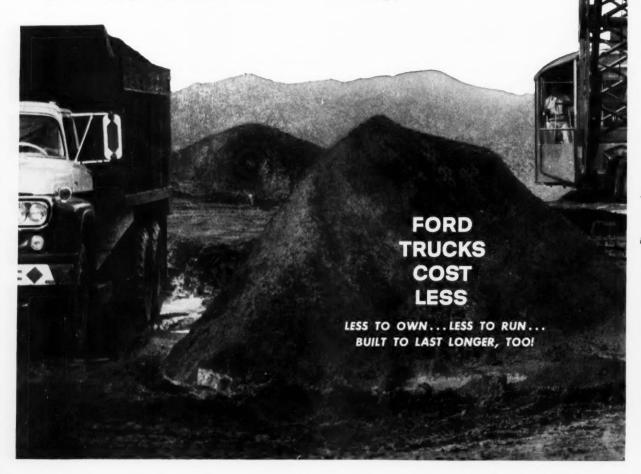
"In the mines or on the road, you just can't beat a Ford!"

SAYS LESTER HINSON CONTRACT HAULER CENTERVILLE, TENNESSEE

"Pulling out of the mines puts a terrific strain on our trucks and we sure don't baby them on the highway! After five years of trying nearly every make, we've settled on Fords because they handle heavier loads and stay on the job with less maintenance than any other truck.

"Even though our loads run us over the manufacturers' rating, we have been able to get excellent mileage out of our Fords before major repairs are required. Both the Ford F-900 and F-800 we bought in 1956 ran 100,000 miles before we had to rebuild any components. The F-800 now has over 150,000 miles and is going strong.

"We traded the F-900 in on two '59 Ford Tandems in order to meet increased production requirements and stay within axle load limits. I drive the T-850 myself and it's the smoothest ten-wheeler I've ever been in. That '477' engine has what it takes to make the grades in style and it hasn't missed a trip yet!"





CERTIFIED ECONOMY... Yes, this year, if you buy a Ford Truck, you get a truck with certified economy in the three major expense items: gasoline, tires and initial price.



Best Gas Mileage! Results of second running of Economy Showdown U.S.A., show 1960 Ford ½-ton pickups won every test—beat the average of other four leading makes by 13.1%.



Double Tire Life! Under average conditions, Ford's truck-type front suspension gives double the front tire life of that obtained with "soft-type" independent suspension used on some '60 trucks.



Lowest Prices!* New 1960 Ford ½-tonners are priced from \$33 to \$181 below those of leading competitive makes. List prices of Ford Light and Medium Duty models are lowest in their class.

CERTIFIED DURABILITY... The refinements built into the '60 Ford Heavy and Super Duty Trucks for longer life and greater reliability will also bring savings to your operation.



Automatic Radiator Shutters, standard on all Super Duty models, add greatly to engine life . . mean less expansion and contraction, more efficient combustion and better lubrication.



Dynamometer Tests of Ford's submerged-type electric fuel pump showed no power loss at temperatures up to 200° F, vs. 9% loss with mechanical fuel pump under the same conditions.



Shaker Table Tests plus constant exposure to oil, water and heat proved Ford's 1960 wiring harness to be three times longer lived than the 1959 harness.

CERTIFIED ECONOMY REPORTS . . .



Certified results of these and other tests conducted by America's leading automotive research organization, plus a comparison of manufacturers' suggested list prices, are now available at your Ford Dealer's. Take him



Kolbe wheel moves 3,500 cubic yards of overburden per hour, discharges load more than 420 feet away.



How Cuba Mine saves on cost of lubricating the Kolbe wheel

Only 9 products to do all lubricating jobs on earthmoving giant



Cuba Mine management knows how to hold down operating costs—including lubrication. Standard Oil lubricants are used throughout on the Kolbe wheel.

Here's how money is saved on lubrication of the Kolbe wheel:
(1) The best lubricants and greases are used. This means lubrication breakdowns don't happen. Thus, idle plant charges are eliminated. Lubricants and greases last longer. So do motors and parts. (2) Quality products do more jobs. With only nine products, savings are made in handling and inventory. There are fewer products to train men to apply and fewer chances of application mistakes. (3) One source means one responsibility for keeping the mine supplied with the petroleum products needed. And from one source mine management can get responsible lubrication technical assistance, and they can get it in a hurry. Ken McDaniel, the mine's Standard Oil man, lives less than 45 miles away.

The lubricants and greases that will save you money and the technical assistance to show you how to use them are available from Standard Oil. Call our office near you anywhere in the 15 Midwest or Rocky Mountain states. Or write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

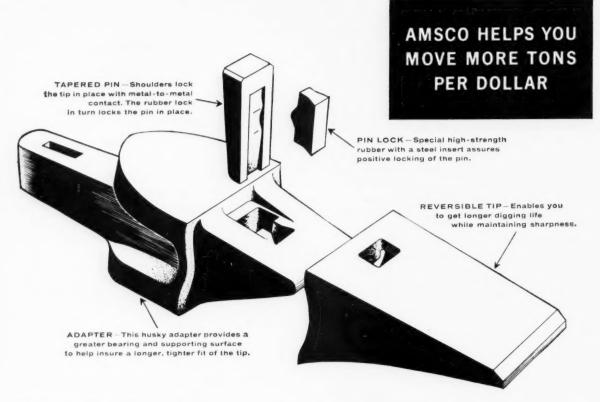


You <u>expect</u> more from STANDARD and you <u>get</u> it!

Lubricants and Greases <u>used on</u> the Kolbe Wheel

STANOGEAR Compound Nos. 3, 5, 6, 8
RYKON Grease No. 2, E. P.
CALUMET Viscous Lubricant
STANOLUBE HD Moly Grease
STANOIL Industrial Oil
INDOIL Industrial Oil No. 15







AMSCO CAST MANGANESE STEEL DIPPERS Installed as original equipment on many leading makes of power shovels. Cast of manganese steel—"the toughest steel known"—a material which provides as much as a ten-toone advantage in lasting power over other steels, under the abuse of severe impact and abrasion. Sizes from ¾ cu.yd. to 9 cu.yd. capacity.



AMSCO HARDFACING FOR BUILD-UP AND REPAIR—Add extra service life at low cost to dippers, dipper teeth, hammers, augers, etc. ...with Amsco Hardfacing. Complete line of hardfacing electrodes available through your Amsco welding distributor. Or write us for condensed catalog and price list on "Amsco Hardfacing Alloys".

AMSCO SIMPLEX* 2-Part Dipper Tooth extends digging life stays sharp • easy to replace

Now you can save hours of costly shovel downtime . . . by using this new Amsco Simplex 2-Part Tooth. Simplex tips are quickly reversible to give added tip life while retaining sharpness. And when teeth eventually become worn, just knock out the retaining pin and replace with a new tip.

Simplex adapters fit this new 2-part tooth to any Amsco dipper or backhoe. And because Amsco makes both dippers and dipper teeth, you can be sure of proper fit between the adapter and shovel lips.

Cast of a new alloy especially developed for this service, the Amsco Simplex design is backed by over 50 years of experience in producing dippers and dipper teeth for the most rugged digging conditions.

Ask your power shovel distributor to supply you with these extra-long-wearing Simplex 2-part teeth . . . now!

WRITE US for complete descriptive bulletin on Amsco Simplex teeth, giving information on sizes and types available.

*Patent No. 2,904,908



AMSCO

American Manganese Steel Division . Chicago Heights, III.

Other Plants in: Denver • Los Angeles • New Castle, Dela. • Oakland, California • St. Louis
In Canada: Joliette Steel and Manitoba Steel Foundry Divisions
Welding products distributed by Canadian Liquid Air Co., Ltd.

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RUSLON PVC BELTING OUT-PERFORMS
OTHER TYPES OF BELTING ON EVERY
COUNT...FROM RUGGED DURABILITY TO
ADDED LIFE EXPECTANCY

COMPARE THESE FEATURES

- Solid Woven Nylon Carcass US Patent
- Thorough Plastic Impregnation US Patent
- Completely Fire Resistant USBM 28-25
- Impervious to Moisture and Oil
- Superior Ability to Hold Fasteners
- No Ply Separation
- Better Troughing and Training
- Higher Tensile Strength
- Higher Coefficient of Friction
- Tear Resistant Lighter Weight

Write for Descriptive Bulletin

distributed b

WEST VIRGINIA BELT SALES, INCORPORATED, MOUNT HOPE, WEST VIRGINIA

manufactured b

The Russell Manufacturing Co., Middletown, Conn.—Engineered Belting Since 1834

News Roundup

P & R Head Sees Success For Chemical Project

'AFTER SEVERAL YEARS of intensive investigation, we are on the threshold of establishing an important chemical enterprise," Howard A. Newman, president, Philadelphia & Reading Corp. told a meeting of the N. Y. Security Analysts February 23, 1960. He took the occasion to report progress on P & R's plans to build a \$100-million plant near Pottsville, Pa. to make chemicals from anthracite silt and wastes (Coal Age, July, 1959, p 98). His speech followed announcement, February 2, that General Dynamics Corphad pulled out of the project (Coal Age, March, 1960, p 28).

Mr. Newman elaborated on the chemicals venture as follows:

"Admittedly, there is a great deal of romance in taking vast stores of waste material which have accumulated for almost a hundred years and through the application of modern technology and great amounts of capital, turning them into valuable industrial chemicals. However, I would like to emphasize that in view of our existing and growing earning power from manufacturing enterprises the rewards which this chemical venture holds forth, although intriguing indeed, are not by any manner of means the most important feature of our future. Reading Chemical Corp., a wholly-owned subsidiary, was formed about two weeks ago. Forming a corporation, of course, is a simple step but it makes the important point that we are actually going into the chemical business.

"I am not unaware of the skepticism which has been voiced in some quarters. Frankly, it was only after a \$1,000,000 worth of tests, studies and investigation over a period of several years that I became convinced myself, (1) that our 50,000,000 tons of silt could be turned into low-cost electric power profitably, (2) that our 350,000,000 tons of refuse material could be converted into synthesis gas and related chemicals, profitably, and (3) that this cheap power and our readily available anthracite coal could be made into calcium carbide and acetylene profitably. Nobody at Philadelphia and Reading had the background to appraise this immense venture in detail. We, therefore, hired the best outside and objective talent that we could find in order to advise us. Studies have been made for us by many experienced organizations including Hydrocarbon Research, Arthur D. Little, Blaw-Knox Co., and Commonwealth Associates. Large-scale commercial tests were conducted in German-built equipment in Europe and our late partners, General Dynamics, had this work further checked and rechecked by Scientific Design Co. as well as Singmaster & Brever.

The 50,000,000 tons of raw silt which I have referred to is the principal raw material in the making of cheap electric power. It would have been comparatively simple to produce and sell electric power, reap a profit of several millions of dollars annually and turn our attention to other things. However, it was obvious that since cheap electric power is the keystone of many electro-metallurgical and electrochemical enterprises, that we should first investigate the possibility of greater opportunities in upgrading our low-cost power into chemicals before committing our resources solely to the production of power.

"All of the studies and commercial tests have indicated that we can profitably produce calcium carbide, acetylene and vinyl chloride on a large scale for ready markets. Our development work has been completed and we are now in the practical phase of setting up this new business. We are presently conducting an intensive search to hire a top-grade chemical executive with a proven record of success in this field, to head up Reading Chemical Corp. In the meantime, we are proceeding as rapidly as is consistent with sound practice toward the day when we can let contracts for the final engineering design and construction of the required facilities.

"Our erstwhile partners who, by agreement, were in administrative control of the project during the period of final testing and organization personally assured our Board of Directors in December, 1959, that by early spring, 1960, the financing would be completed, the output would be sold on long-term contracts, the engineering would be completed and construction would commence. At the time of their withdrawal three weeks ago that happy state of affairs was a long way from reality. As a result the start of construction is probably 9 mo away. We have lost a great deal of time and I

cannot now predict a firm construction

schedule.

"It is my hope that we will be able to let the initial engineering contract for the power plant within the next few weeks. With respect to our proposed hydrogen-chemicals complex, most of our recent planning and thinking has contemplated the establishment of units which would produce 50,000,000 cu ft per day of synthesis gas which would be used in turn for the manufacture of 700 tpd of ammonia, part of which would be used for the production of urea, formal-dehyde, ammonium nitrate, and nitrogenous solutions.

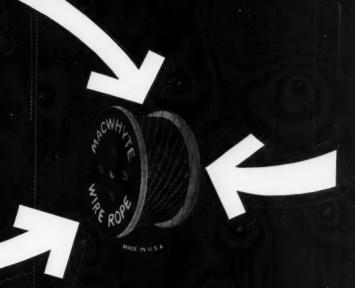
"In addition, we have engaged the services of an outstanding scientist and authority on the direct reduction of iron ore with hydrogen to further our studies in this field. This will serve several important purposes. First, we will make certain that we are using our stockpiles for the production and use of hydrogen in a way that will yield the greatest profit. Second, by the time this determination is made, our calcium carbide, acetylene, vinyl chloride, steam and power complex will be organized and well under way. Third, we will not only be phasing out our engineering and construction but we will also be able to do our financing in steps. In view of the fact that this entire project, when it is completed, contemplates the use of as much as \$130,000,000 of capital, you can readily understand why we prefer to phase the engineering, the organization as well as the financial requirements. As we proceed it may be that another chemical company or group of companies with technical staff and captive markets will want to join in this project.

"If such a company or group of companies does join our enterprise, the chances are that it will also serve to solve

In This Section

People in Coalp	38
Current Coal Patentsp	42
Preparation Facilitiesp	46
Coal Abroadp	50
Equipment Approvalsp	55
Mines and Companiesp	56
Utilizationp	56
Coming Meetingsp	66

There's a reason WHY in WHYte Strand Mining Ropes



They bring out the best in your mining equipment!

Just as you use specialized equipment for a particular job, it pays to use the right kind of wire rope designed for that equipment.

All wire rope isn't the same. There are changes in the construction of wire rope . . . which aren't obvious to the eye . . . but can seriously affect the way it will work on your equipment. Because all equipment isn't the same, different types of rope are required because of basic design variations.

With this in mind, you can see the reason "why" Macwhyte offers such a wide variety of wire rope:

- Every foot of wire in Whyte Strand is specially drawn, cold-worked by Macwhyte in their own wire mill. Complete processes from raw material to finished wire for rope are under the watchful eyes of Macwhyte metallurgists.
- Product engineers determine the exact number, size, and relationship of the wires needed to meet the requirements of your equipment. You're sure of the correct size, strength, and flexibility.
- Special lubrication is available in accordance with the needs of the equipment or the type of service in which the rope will be used. The tenacious lubricants provide just the necessary protection—are unaffected by heat or cold, dry or wet conditions.
- Entire wire and rope mill operations are concentrated on the making of wire rope in a thousand and one sizes, grades, and types . . . to give you the rope you need.

Result: Whyte Strand wire rope is literally "custom made" for strip shovels, loading shovels, draglines, shaft hoists, haulage, underground scrapers, loaders, mining machines, conveyors, car pullers, and blast hole drills. Ask for new bulletin 6025 giving complete listings of Whyte Strand wire rope.

MACWHYTE Wire Rope COMPANY

2900 Fourteenth Avenue, Kenosha, Wisconsin, U.S.A.

any financing problems because our combined equity contributions plus borrowing power will be sufficient. If, however, no such amalgamation occurs by the time we need a great deal more capital, we will consider offering part of the equity of Reading Chemical Corp. to the public giving our stockholders rights to subscribe in the first instance.

"Two principal questions have been asked of me over the past few weeks over and over again. One is why, if this was such a profitable venture, did General Dynamics decide not to go ahead. All I can tell you is that Dynamics gave no reason, and I am not in a position at the present time to say anything about their motivations in reaching such a decision.

"The second question has been why there has been so much general confusion and misunderstanding about this power and chemical enterprise. Partly, I suppose we are to blame because we wanted to guard our competitive position. Once we were sure that we could enter the chemical industry through the use of our silt and refuse reserves we would have been foolish to publish all the details until we first made certain that no other anthracite company could offer us any important competition. This I am happy to say appears to be the case. There is a lot of silt and refuse scattered all through the hard coal region. But the point is that it is scattered and ours is concentrated. There is not a sufficient concentration of material of the proper quality within a short radius of any prospective plant-site to offer attractive rewards for the capital investment that would be required.

"But the most important reason for confusion about our chemical enterprise oddly enough is that it is so simple. The great mental obstacle is that it is not that the venture is novel or exotic or technically advanced but that it is so obvious and uncomplicated. Our chemical venture will include no new processes, no recent laboratory discoveries, no novelty techniques, no new products, no innovations of any kind; every process, every piece of equipment throughout the enterprise is already proven and has been in use for many years in full scale commercial installations at various places over the globe. There will be no scale up problem -no pilot plant extrapolations. This is one reason why we are going to invest so much money with such confidence. Nevertheless, the chemical venture does have its unusual aspects.

"The first unique aspect is that unlike most chemical companies we shall not have to buy our basic raw material. The principal raw material reserves are the great mountains of silt and refuse which I have described earlier. This great in-

Titanic Shovel ... Will Be Largest Land Vehicle

AN AWESOME new 115-cu yd shovel (see cover) will, before very long, swing its cavernous dipper back and forth at a western Kentucky strip mine belonging to Peabody Coal Co., St. Louis, Mo.

Bucyrus-Erie Co., South Milwaukee, Wis., is building the machine, which will tower as high as the deck of the Golden Gate Bridge and 45 ft higher than Niagara Falls. Peabody is betting the colossal digger, which will be over twice the size of any shovel now operating, will lower considerably the cost of mining deeply-buried coal which otherwise could not be recovered economically by strip mining.

Statistics—Working weight of the machine will be 14 million pounds, the equivalent of 4,500 average automobiles. It will have a reach of over 460 ft and will move on eight crawler treads, each over 8 ft high. Shipping components for the shovel, says Bucyrus, will require 250 railroad cars.

Mechanics – Fifty electric motors, ranging from ¼ to 3,000 hp, will run the mechanism, using enough electricity

to power a city of 12,000 people. A half-million cubic feet of air per minute will be needed for motor cooling alone. The entire shovel will be supported on four sets of dual crawlers, automatically leveled and equalized by four hydraulic jacks. The hydraulic system will swallow 4,000 gallons of hydraulic fluid.

Production—Five stories up, one operator in an air-conditioned cab, will possess fingertip control of a half-million pounds of material per pass, moving at a top speed of 25 mph. He will be able to accelerate each load from 0 to 25 mph in 8 sec, decelerate from top speed to stop in 4 sec. Thirty-six million yards of overburden will be removed annually. Each day, 14,000 tons of coal will be laid bare, enough to heat 7,500 average homes for one month.

Schedule—Bucyrus-Erie will manufacture the new 3850-B shovel at its South Milwaukee plant. Erection will require 6 to 7 mo at the mine site, according to the company. Completion is expected to take at least 2 yr, it was added



HONORED at a special luncheon of the Coal Exporters Association of the U. S., Inc., is F. F. Estes, retiring executive secretary of the organization. At the gathering, held Feb. 25 in New York, the directors adopted a resolution expressing deep appreciation to Mr. Estes for his untiring service and awarding him the title of "Executive Secretary Emeritus." Attending were (left to right): Seated—Earl C. Robertson, vice president, sales, Pocahontas Fuel Co.; Mildred Loveless, assistant secretary-assistant treasurer, Coal Exporters: John S. Routh, president, Coal Exporters and chairman of the board, Routh Coal Export Corp.; Mr. Estes; Harry Bartley, vice president, Imperial Coal Corp. Standing—W. H. Carpenter, president, Dexter-Carpenter Coal Co., Inc.; Thomas Howarth, treasurer, Coal Exporters, and secretary and assistant treasurer, NCA; D. T. Buckley, chairman, Govt. Relations Committee, Coal Exporters and assistant to president, Castner Curran & Bullitt, Inc.; D. K. Mackenzie, vice president, Castner, Curran & Bullitt, Inc.; and A. A. Meyer, president, Saljoan Coal & Coke Corp.

ventory of raw materials is on our books for but a few dollars. There is enough material to more than outlast the depreciable lifetime of the plants we contemplate building. Most other chemical companies on the contrary will have to buy their raw materials, such as natural (Continued on p 62)

Announcing 3 NEW CARMET Mine-Tested Cutter Bits

Here's a trio of precision-made cutter bits, proven in operation to give long service under tough mining conditions. Your Carmet distributor carries them, and cutter bits for every mining operation, in stock. Check with him now.



Carmet JC Style Colmol and Boring Bit

Note the collar support that prevents bit block from splitting. Shank is forged from high-alloy heat-treated steel. Tough, hard, wear-resistant carbide tip is double-bonded by mechanical cap. Long operating life under all conditions.



Carmet JR Style Cylindrical Bit

Another new outstanding Carmet bit for use on all cutting machines and continuous miners. Tip is embossed in high alloy heat-treated steel.

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Usio, Steel Supply Company, Penney, Penney
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Revised 5th edition contains application data and specs on full Carmet Mining Tool line, including sections on grinding and reconditioning. For your copy, see your distributor or write Carmet Division, Allegheny Ludlum Steel Corp., Detroit 20, Michigan.

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Carmet GV Style Bit for Joy Cutter Chain

Designed with husky bull-neck for use on Joy GV-6111 cutter chain. Style GVR has drilled carbide insert brazed into shank for maximum support. GV series available with double-bonded insert brazed to milled shank.



CEMENTED CARBIDE DIVISION OF ALLEGHENY LUDLUM STEEL CORPORATION



March Tragedy

Eighteen men perished in an underground fire which started March 8 at Holden Mine No. 22, Island Creek Coal Co., Holden, W. Va. Preliminary reports indicated the fire started when a small roof-fall snapped a trolley wire.

Twenty men were in the mine when the accident occurred, but two of them, William Carter and Kyle Blair, managed to crawl 21/2 mi through abandoned workings to reach safety. The others, who apparently died from asphyxiation, were found huddled together in several sections of the mine.

Rescue workers, who battled fire and smoke with makeshift ventilating systems, were not able to reach the trapped miners for more than a week. Some, commenting on the tremendous intensity of the heat and smoke, expressed belief that the victims may have succumbed quickly after the acci-

dent.

As reported by Island Creek, the victims included: Charles Adams, stoper operator; Frank Ardis, track crew leader; Ernest Bevins, shuttle car operator; Okey Bryant, trackman helper; James Carter Jr., continuous miner operator; Josh Chafin, section foreman; Roy L. Dempsey, trackman; William K. Donaldson, safety engineer; Garfield J. Hensley, motorman; Berti Horvath Jr., shuttle car operator; Flint Lock Jerrells, continuous miner helper; James V. Lundell, industrial engineer; Albert Marcum Jr., shuttle car operator; Melvin Newsome, continuous miner helper; Isom Ooten, stoper operator; Walter Orville Sargent, shuttle car operator; Clyde White, motorman; and Louie Workman, section foreman.

Ruling For Coal

An Interstate Commerce Commission examiner has ruled that 56 coal-carrying railroads were justified in cutting freight rates to keep major Atlantic Coast utilities from switching to oil.

Coal saw its utility business slipping in 1958, pinned the blame on mounting oil imports and falling oil prices. And tanker deliveries to utilities on water were giving oil a competitive edge over coal. For example, at the start of 1959, Con Edison Co. of New York had to pay \$10.53 a ton for coal and could buy equivalent oil heat for \$9.57.

Hit Back-Con Ed put coal on notice that it would sharply reduce coal consumption if prices remained steady. Fighting back, coal producers in the Appalachians cut their mine price 25c a ton and the railroads offered to cut rates for that part of the market that

could be ousted by oil. Savings to utilities were to be about 50c a ton.

These concessions changed the picture. Con Edison and other East Coast utilities which had also been planning a coal-to-oil conversion changed their plans. Now railroads and coal producers are continuing to supply the 9.5 million tons of coal annually to plants equipped to use both fuels, even though the railroads report the plan is costing them about \$5 million a year. This, they concede, is better than a loss of \$40 million with coal totally replaced.

Oil's Plea-The oil men, represented by Empire State Petroleum Association, claim the coal-railroad counterattack was monopolistic, that a shortage of tankers and the mandatory oil imports curbs in effect since last March are sufficient to keep oil from drastically hurting coal on the East Coast.

Not so, said E. L. Boisseree, the ICC examiner. The freight rate cuts wouldn't have been made without "a very real threat of substantial loss of revenue," he declared. Without the cuts, the financial stability of a number of railroads would have been "seriously hampered," he concluded.

More Coal Burn

Kentucky Power Co., subsidiary of American Electric Power Co., will build a \$39 million coal-burning electric power plant on the Big Sandy River, Louisa, Lawrence Kentucky.

Plans for the new plant were announced jointly by Governor Bert T. Combs of Kentucky, and Philip Sporn, president, American Electric Power. The governor hailed the plan as a boon to the economy of eastern Kentucky and in particular to the coal mining industry of that region.

To be completed about the fall of 1962, the 265,000-kw plant will burn approximately 750,000 tons of coal a year, all of which will be purchased from eastern Kentucky mines, according to Mr. Sporn.

New Hopper Cars

Norfolk & Western Ry. reports it will begin construction August I on the first 85-ton hopper cars to be used by any railroad.

The big railroad said 1,000 of these cars would be built in Roanoke, Va., shops at a cost of \$12 million. The cars are an original N&W design and will be the first roller-bearing coal cars owned by the line.

The average hopper car is reported to be a 70-ton car. Designers of the

new-size cars say advantages include lower first cost, lower empty weight and generally reduced handling and maintenance expense per tons of capacity, in addition to increased capacity.

The cars will have 36-in diameter instead of 33-in diameter wheels, generally recognized as standard for freight car equipment, added N&W.

Mining Training

Pennsylvania State University, Dept. of Mining, has released a list of companies which are cooperating in a student-trainee program (Coal Age, Feb., 1960, p 58), to get underway this summer.

The organizations which will employ the mining students 6 mo of the year, include: Climax Molybdenum Co., Climax, Colo.; General Crushed Stone Co., Easton, Pa.; General Refractories Co., Philadelphia 2; Glen-Gery Shale Brick Corp., Shillinton, Pa.; Hanna Coal Co. Div., Consolidation Coal Co., Cadiz, Ohio; Harbison - Walker Refractories Co., Pittsburgh 22; Island Creek Coal Co., Holden, W. Va.; Jones & Laughlin Steel Corp., Pittsburgh 30; Joy Mfg. Co., Pittsburgh 22; Andrew S. Mc-Creath & Son, Inc., Harrisburgh, Pa.; Pocahontas Fuel Co. Div., Consolidation Coal Co., Pocahontas, Va.; Republic Steel Corp., Cleveland, Ohio; Tennessee Valley Authority, Knoxville, Tenn.; U. S. Bureau of Mines, Pittsburgh 13; and U. S. Steel Corp., Frick Dist., Uniontown, Pa.

Trainees will be selected from the ranks of employees and recent high school graduates. They will attend school 6 mo and work in industry 6 mo over a 4-yr period. Remaining in school continuously the fifth year, they will study a rearranged curriculm permitting them to obtain bachelor of science degrees within a 5-yr period.

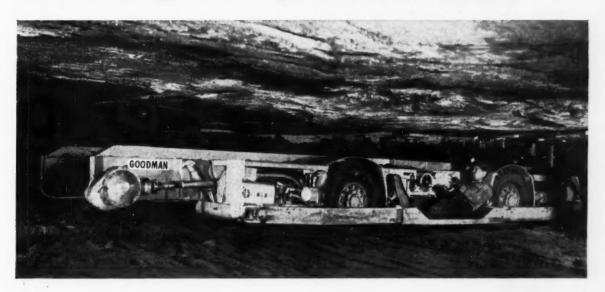
Discuss Plant

Negotiations are reportedly continuing between the Glen Alden Co., anthracite producer with other diversified businesses, and a major chemical firm for construction and operation of a plant to cost \$15 million, near Loomis Colliery, Hanover Township, Pa.

Harry Bradbury, president of Glen Alden, denied recent rumors that the firm was planning to get out of the anthracite business. He said the chemical-processing plant, if erected, would utilize about 500,000 tons of coal per year. This would mean employment for

(Continued on p 56)

3½ to 4 Ton Capacity with Big Car performance



New Goodman type 870-20 low vein shuttle car

This low, wide car combines a big payload and ease of handling with all the structural strength expected only in big cars. Its capacity means fewer car changes per cut, lower elapsed loading time, more production per shift. Four-wheel power steering, 4-wheel power brakes, and 4-wheel drive provide ease of handling ... reduce operator fatigue ... promote safety.

As for strength—wheel units, conveyor chain, gear reducers and electrical control parts are the same as found in big cars, some even interchangeable. Frame and side plates are welded in a rigid one-piece unit reinforced with heavy cross-members. You don't have to worry about cracks or bends under severe conditions.

Make your low coal operation pay off. Team the big car performance and strength of the 870-20 (DC or AC) with the new Goodman 964 low vein loader. Get the full story from your Goodman sales engineer.



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PATTIN roof bolts and expansion shells

The unique double expansion feature of all Pattin expansion shells insures dependable roof support, in hard or soft roof conditions. Their double holding power guards against failure even under a 20 ton pull!

Pattin features include a parallel contact with the hole, and no definite drilling depth is required, as the shell can be securely anchored at any place in the hole. They anchor solidly and will not turn while being tightened. Wedge and shell are assembled in a manner to prevent loss of parts in handling, and the bolt and shell assembly are furnished as a complete unit. Plates are bundled separately. No special nuts or ears are required on the bolts. These features make a safer roof — and a safer roof means fewer accidents, increased pro-duction, more clearance for equip-ment operation and better ventilation.

Pattin specializes in roof bolting—it's our business, not just a side-line! Your business is important to us, and our service engineers are always available for consultation on your roof problems-ready to give you service when you need it! WRITE OR PHONE US TODAY for complete details.



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The split-type balt is one of the first slotted holts, and custinues to be a favorite wherever split-type bolts are used. Many mines still prefor this type. The bolt is a full 1-inch in diameter, with cut threads and furnished with hex or square nuts and various size plates and

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"Years ahead" preparation plant

still meets competition successfully without modification!

Fairview Collieries Corp., Harmattan Mine, Hillery, Illinois



ASK THE MEN WHO KNOW COAL FROM THE GROUND UP

M'NALLY > PITTSBURG

MANUFACTURERS OF EQUIPMENT TO MAKE COAL A BETTER FUEL

Here is proof (10 years of it) that the McNally theme—"The Future Belongs to Those Who Prepare"—really pays off! The "years ahead" design that went into the Fairview Collieries preparation plant—combined with sound marketing and management strategy—has kept this plant competing successfully in a high tonnage market since 1949. And this McNally-built plant produced these 7,464,159 tons—without modification of any kind. This is a real tribute to the advanced engineering that went into its design 10 years ago.

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Pittsburg, Kansas . Wellston, Ohio

This Fairview Collieries installation is one of the most modern, complete washing and thermal drying plants in Illinois.

The R.O.M. feed is reduced to 6 x 0 in a rotary breaker at 600 tph and delivered to two standard McNally Norton Washers. Coming off a bar screen just ahead of the two primary washers, the $1\,\%$ x 0 product is diverted to a middling rewash unit. Coal from all three washers goes over a classifying screen to become a 4", 2", $1\,\%$ " or %" product. The % x 0 passes %" dewatering screens, with % x % going to a mixing conveyor. Larger than % can be loaded out, with minus % product going to the fine coal plant where slurry goes to a desliming sump and is classified at 60 mesh. This product is then centrifugally dried and goes to a disintegrator to be mixed for loading. A scalping vibrator operates ahead of the McNally Rheo fine coal launder to keep oversize out of the Rheo boxes.

In the Stoker Coal Plant washed coal with a top size of 6 x 1½ goes to a primary crusher at 320 tph for reduction to 3 x 0. It passes over a primary double deck vibrating screen to be separated into: plus 1½, 1½ x ½, and ½ x 0. Plus 1½ goes back to original classifying screen or to the secondary crusher. Coal 1½ x ½ goes to a secondary crusher or passes over secondary vibrators to the distributing conveyor. Coal ½ x 0 passes over secondary vibrators. Secondary crusher makes 1½ x 0 or ½ x 0, depending on product wanted, and delivers to secondary vibrators. Secondary double deck vibrating screen makes ½ x ½ separations. Plus ½ goes to loading out, or returns to secondary crusher. Coal ½ x ½ loads out. Coal ½ x 0 goes to transfer conveyor for mixing and loading.

The Dryer Plant takes % x % at 142 tph from dewatering screens and sends it through two McNally Vissac Dryers. One of the dryers takes 1 % x % at 94 tph from the classifying screens for drying.

The "Man from McNally"
offers you an outstanding engineering
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"years ahead" design that goes into
McNally Coal Preparation Plants all over
the world. Get to know him!

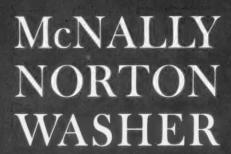


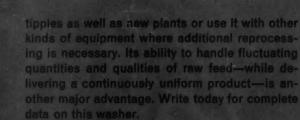
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 ☐ Complete Coal Prepa ☐ Norton Washer 	ration Plants		
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More profit per ton with minimum investment and operating cost...





If you need a washer that will handle heavy tonnages of mixed sizes—and make a clean cut separation of coal from refuse—investigate this famous McNally Norton Washer. Simple in its operation, it offers maximum recovery—even when working high ash seams.

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KEEP OPENINGS DRICK RIFI

Something has been added to Hendrick Wedge Wire Screen. That's right! Wedge Wire is now available with a Riffle Top profile bar for tops in dewatering efficiency and long service life. Exclusive Riffle markings on the upper surface of the wedge wire guide fluids directly to openings for greater draining capacity. And - the Riffles also lift over-size particles above the screens normal opening level . . . keep wear caused by abrasion down to an absolute minimum. For more information on Hendrick Wedge Wire's free clearance; rugged mechanical and lateral strength; extra load carrying capacity and large percentage of open area, call your local Hendrick representative or mail the coupon today.

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People in Coal



Elected President

EDWIN R. PHELPS has been elected president of The Pittsburg & Midway Coal Mining Co., Pittsburg, Kan. He succeeds the late Kenneth A. Spencer.

Mr. Phelps joined the company in 1948 as an engineer and in 1951 was named superintendent of Mine No. 19, near Pittsburg. In 1952 he was selected as general superintendent and in June, 1953, was appointed vice president in charge of operations, holding that office until his appointment to the presidency.

Born in Leavenworth, Kan., Jan. 12, 1915, he graduated from the University of Kansas School of Engineering in 1937 with a BS in civil engineering, then served as engineer and assistant superintendent of the Southwestern Illinois Coal Corp., Percy, Ill. In 1942 he began 4½ yr of service as an officer in the Navy Air Corps, following which, he served as construction superintendent of the Constant Construction Co., Lawrence, Kan.

Besides being a director of Pittsburg & Midway, Mr. Phelps devotes much of his time to The Mo-Kan Council of Boy Scouts and the Pittsburg United Funds. He is a member of many organizations, including: the advisory committee for the School of Engineering and Architecture, of Kansas University; the National Coal Policy Conference, Inc.; the Natural Resources Committee of the U. S. Chamber of Commerce; and the National Society of Professional Engineers.

He is chairman of the American Mining Congress strip mining committee, president of the J. L. Hutchinson Little League Baseball Corp., and head of the Crestwood Country Club. In 1957, he was part of an American team of coal experts sent to Poland to offer technical aid.



Frank Nugent, president, Freeman Coal Mining Corp., Ill., has been appointed a vice president of General Dynamics Corp., N. Y. Mr. Nugent has been a vice president and director of Material Service Corp., recently merged into General Dynamics as a Chicago division. Born in Evanston, Ill., he started his career with the Chicago, Rock Island & Pacific R.R. Co. He joined Freeman over 30 yr ago. In the Freeman organization, Mr. Nugent worked his way up, becoming vice president in charge of sales in 1929, executive vice president in 1946 and president in 1957. Under his leadership, the company has become one of

the largest coal producers in the United States. He is president and chairman of the executive committee of the Mid-West Coal Producers Institute, Inc., a member of the board of the National Coal Policy Conference, Inc., and a director of the National Coal Association and the Illinois Coal Operators Association.



Dr. Myles E. Robinson has been appointed secretary of the Coal Exporters Association, Inc., replacing F. F. Estes, who retired March 1 after 15 yr of service. Dr. Robinson is director of economics and transportation of the Nation-

al Coal Association, with headquarters in Washington. He was born in Columbus, Ohio, and received AB and AM degrees from Ohio State University and a Ph.D from Northwestern University. After 17 yr as a university faculty member, he served as a transport economist with the Interstate Commerce Commission and head of research for the Air Transport Association before joining NCA in 1956. "His affiliation with the coal export group insures maximum cooperation between NCA and CEA," said Stephen F. Dunn, president of NCA.

Valley Camp Coal Co., Cleveland, Ohio, has elected Harry T. Ewig to a newly-created position of chairman of the board and chief executive officer. Mr. Ewig had been president of the firm. Herbert S. Richey, former executive vice president, is the new president, and Herbert L. Hilton was elected a vice president. Mr. Ewig has been with Valley Camp since 1916. He was elected treasurer in 1925 and president in 1933. Mr. Richey, residing in Bay Village, Ohio, attended Case Institute of Technology for 2 yr, followed by 2 yr at the University of Michigan where he graduated with a BS in engineering. He began his career with the company in 1946 as a mining engineer and in 1951 was promoted to executive assistant. In 1956 he was elected a vice president, a member of the board of di-



BLASTING IS OUT— D9 AND RIPPER IN— PRODUCTION

UP 35%

Gillen Coal Mining, Inc., is salvaging a six-ft.-thick seam of coal near Carbondale, Pa. To get to the coal, 180 ft. of overburden must be removed—10 ft. of topsoil, 100 ft. of hardpan and, finally, 70 ft. of rock.

Gillen used to blast through. Then they changed to a Caterpillar D9 Series E Tractor with a No. 9 Ripper. Production shot up 35%. Cost savings are estimated to be 60%!

The overburden, rough as it is to work with, is the kind of material the D9 and No. 9 Ripper eat up. Working in 50-ft. passes, the team fragments the hardpan (average cu. yd. weight 3200 lb.) into right-size pieces for two Cat DW21s. They're moving up to 4000 yd. a seven-hour shift. When needed, the D9 pushloads the scrapers and 'dozes, too.

The D9 and No. 9 is an all-business combination of power and speed. The Series E Model D9 has a 335 HP (flywheel) turbocharged engine to put massive power into the work. You get more power from every gallon of fuel. The Series E D9 has a heavier undercarriage. Track components are bigger, heavier. You get up to 40% more

life with deeper hardened steel shoes, links and rollers. A new equalizer bar makes the Series E D9 even more stable.

New power shift transmission gives you the flexibility and anti-stall features of a torque converter with the splitsecond snap of direct drive. Finger-tip control gives operators instant changes under full load without clutching.

Match this with the No. 9 Ripper to break your way through production bottlenecks. For the right tractor-ripper combination, see your Caterpillar Dealer, who will prove his recommendation with a demonstration.

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PROX PT-2 TAPERED SHANK BIT

America's #1 performer



PT-2 Lug for disc type Lee-Norse head.

Adapter for spoke-type Lee-Norse head.

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TWICE AS GREAT AS 1/2 X 1!

Less inventory, less maintenance no set screws, roll pins, or rubber retainers.

Round shank exceeds 3 times the back-up area of conventional bits. Incorporates improved aligning—assures perfect match between holder and bit—is easily removed from top or bottom. You get less distortion; positive bit-angle maintained; quicker, more accurate setting; no bit-vibration; longer life for carbide.



Write for the name of your nearest Prox Sales Representative for complete information.

Equipment News (Continued)



Mr. Richey

rectors in 1957 and in 1959 became executive vice president. Mr. Hilton, who lives in Wheeling, W. Va., has been with Valley Camp since his graduation from Lehigh University in 1938 with a BS in business administration. After holding several positions in the firm, he was elected a vice president of the Pennsylvania & West Virginia Supply Corp., a Valley Camp subsidiary.

George R. Higinbotham, president of Mountaineer Coal Co., division of Consolidation Coal Co., Pa., has received the "Engineer of the Year" award from the Fairmont chapter of the West Virginia Society of Professional Engineers. Mr. Higinbotham was honored for "the foresight and vision by which he conceived the comprehensive plan of developing at Loveridge W. Va., one of the world's largest and most fully automated coal mines."

Sherman E. Burt will head a new Dept. of Membership Relations for the National Coal Association. The department will work to strengthen the association's membership base throughout the bituminous coal industry. Mr. Burt, who has wide acquaintance with coal men, joined American Coal Sales Association in 1937 as assistant secretary and counsel, after serving with the Bituminous Coal Commission. He received a law degree from George Washington University in 1938, afterwards leaving ACSA to become vice president of Continental Coal Co., Seattle, Wash. He rejoined ACSA as general counsel in 1955. He is chairman of the coal committee for the American Bar Association's section on mineral and natural resources law.

 $\begin{array}{ccccc} \mbox{Mid-West} & \mbox{Coal Producers} & \mbox{Institute,} \\ \mbox{Inc., has elected the following officers} \\ \mbox{for} & \mbox{1960: chairman of the board} - \end{array}$

Stuart Colnon, president, Bell & Zoller Coal Co., Chicago; president - S. L. Jewell, vice president, Peabody Coal Co., St. Louis, Mo.; first Vice president - Frank Nugent, president, Freeman Coal Mining Corp., Chicago; second vice president-Mark E. Eastin Jr., president, West Kentucky Coal Co., Madisonville, Ky.; third vice president-W. S. Webster, president, Snow Hill Coal Corp., Terre Haute, Ind.; treasurer-J. M. Morris, president, United Electric Coal Cos., Chicago; secretary and manager-J. E. Tobey Jr., Chicago 1; assistant treasurer - Martha A. Terleke, Chicago 1.

Raymond E. Salvati was recipient of the Erskine Ramsay Gold Medal of the American Institute of Mining, Metallurgical & Petroleum Engineers at the AIME national convention held recently in New York. Mr. Salvati, president of Island Creek Coal Co., W. Va., received the award "for his outstanding contributions and achievements in the development and application of modern technology in underground coal mining and in the preparation of bituminous coal, and for his many years of distinguished leadership within the industry.

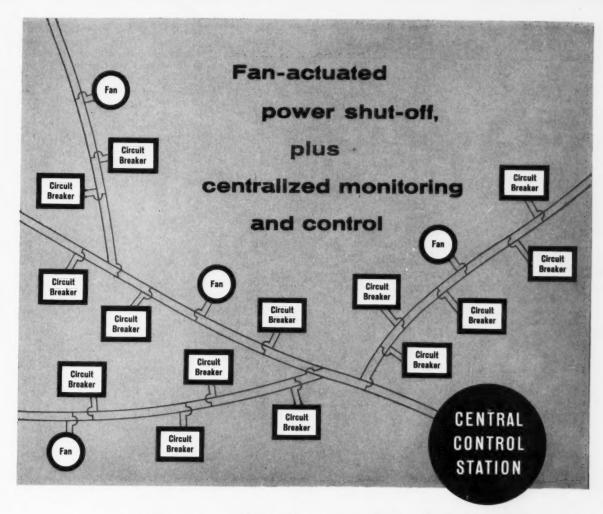
William G. Leake, formerly superintendent of Jamison No. 21 mine for Consolidation Coal Co., Pittsburgh, has been appointed superintendent of Pittsburgh Coal Co.'s Hutchinson mine, Pa., replacing Lloyd A. Warner, who resigned. Pittsburgh Coal is a division of Consolidation Coal. At another Consol division, Mountaineer Coal Co., James A. Harmer has been appointed superintendent of Williams mine, W. Va., succeeding Harry Williamson, who has gone with another firm.

C. Ward Padgett, veteran coal mine superintendent, has been named assistant general superintendent of Oklahoma coal mines for Lone Star Steel Co. Mr. Padgett, son of a coal miner, started his mining career in Indiana. He came to Lone Star from Bell & Zoller Coal Co.

Obituaries

Bailey Moore Neel, 52, vice president of Wise Coal & Coke Co., Va., died Feb. 26. He had been with Wise since 1957. Previously, he was associated with Stonega Coke & Coal Co., in Virginia, and with Pennsylvania operators for almost 20 yr. He was the son of the late Charles B. Neel, former secretary of the Virginia Coal Operators Association.

T. O. Hammond, 82, former president and chairman of Independent Coal & Coke Co., Salt Lake City, Utah, died recently. President of Independent from 1946 to 1951, he was also a leading Montana business leader and banker.



... over a single pair of wires

Here's what this new FEMCO system provides:

- Automatic shut-off of power going into the mine, in the event of fan failure.
- Centralized monitoring of all fans and circuit breakers.
- 3. Selective remote control of circuit breakers.

Any number of fans and circuit breakers, in any combination, can be handled over a single pair of wires in the mine or on the surface.

Fan monitoring is continuous. Two indications for each fan are provided, one showing that fan pressure is normal, the other showing fan speed. Loss of pressure at any fan automatically shuts off all power to the mine after a predetermined interval from 0 to 30 minutes. It

also sounds an alarm, at the office, which continues until silenced. Monitoring of circuit breakers is on a programmed basis.

The time-saving advantages of this system are obvious. Fan monitoring permits instant identification of the fan which is malfunctioning, and centralized control of circuit breakers makes it possible to restore power at all locations in less time than it would take a man to reach any one of them.

Femco Monitoring and Control Systems are now in operation in a number of leading coal mines, and more installations are being made each month. For full information, write to FEMCO, INC., IRWIN, PA. We will be glad to discuss your specific requirements.

Femco

COMMUNICATIONS: Carrier and wired audio systems for all mining and industrial applications. MONITORING: Fans, circuit breakers, valves, pumps, compressors, etc. TELEMETERING: Flows, pressures and other functions. REMOTE CONTROL: Pumps, valves, circuit breakers, soaking pit covers, furnace doors, creases, or other moving equipment.

mine floors. U. S. Patent No. 2,925,900.

By: Oliver S. North

Four wheel driven mine haulage vehicle with plural-propulsion unit compartments, A. L. Lee (assigned to Consolidation Coal Co.), Feb. 16, 1960. Design for a mine shuttle car having improved propelling and steering means, such as traction and steering wheels, adapted to be driven by alternative sources of power, such as AC or DC electric motors or an internal combustion engine. No. 2,925,136.

Tunnel boring machine having torsion counteracting means, J. S. Robbins (assigned to Goodman Mfg. Co.), Feb. 16, 1960. An improved means is provided for anchoring the main frame of a boring mining machine against the tunnel walls so as to counteract the torsion of the rotary cutter head and aid in restoring the main frame to its proper upright position when it gets out of correct angular relation to the tunnel bore. No. 2,925,258.

Boring type continuous miner bit

mounting device, C. H. Brown (assigned to Goodman Mfg. Co.), Feb. 16, 1960. Simplified form of bit mounting means for a continuous mining machine which is readily detachable from the rotary cutter support for the machine and accommodates the replacement of dull bits No. 2.925.259.

Apparatus for loading coal, M. T. Coffman, Feb. 23, 1960. Method and mechanism for the side loading of a coal conveyor which simultaneously provides a substantially clear plane traction surface in the mine over which the conveyor is advanced during the loading process. The machine requires six inches or less of head room beneath a fractured cut of coal. No. 2,925,899.

Extensible belt tail section and buggy therefor, D. D. Murphy (assigned to Joy Mfg. Co.), Feb. 23, 1960. Design for an extensible belt conveyor which incorporates improved means for permitting greatly increased relative lateral and verticle swing of an extensible belt tail buggy, thereby eliminating belt damage from the movements caused by uneven

Reversible extensible belt conveyor, E. C. Hallman (assigned to Joy Mfg. Co.), Feb. 23, 1960. Design for an extensible belt conveyor incorporating means for selectively pulling the material-carrying strand of the endless belt in either an outby direction or an inby direction. The reversal may be readily and easily accomplished by disconnecting the main belt drive and effecting appropriate drive of one or more pulleys rotating on stationary axes on the drive buggy. No. 2,925,901.

Drive means for continuous mining machine, C. B. Krekeler (assigned to The Cincinnati Mine Machinery Co.), Mar. 1, 1960. In an improved construction for a continuous mining machine, accurate alignment between the splines on the center and outer parts of the shaft is rendered unnecessary by floating the two outside sprokets on the shaft and thereby reducing the load on the outside chains. Single toothed sprockets are used. No. 2,926,896.

Drive means for a mine haulage vehicle, A. L. Lee (assigned to Consolidation Coal Co.), Mar. 8, 1960. Design for a mine shuttle car having a single





WHAT'S WRONG WITH THIS PICTURE?

Something backwards, maybe?

Sure, the dragline. It's working from the spoil pile, not the highwall.

Maybe it seems backwards, but there's nothing backward about this operator who is uncovering 30% more coal in a given period of time than he was with conventional methods. And he's cut bulldozer reclamation time, and dragline maintenance costs too.

This new development is "explosives stripping"... heavy shooting with overburden loaded to at least 1 lb. of blasting agent per cubic yard. Sure, drilling and explosives costs are higher... about 20%. But look what happens! Up to 40% of the muck is moved right

onto the spoil pile without any mechanical handling. That's a lot of overburden you don't have to handle.

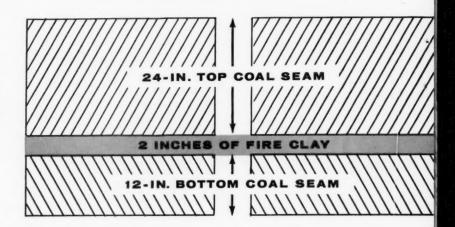
Breakage is better, digging easier. Digging methods are easy too. The drag works from one end of the shot at a slight angle to the highwall, cutting a keyway. Then, with a bulldozer smoothing the way, it walks right along the spoil pile dragging from the keyway. As the material is scooped off, the dragline swing becomes less and digging efficiency goes up even more.

This is a new development you can't afford to ignore, but you may have to see it to believe it. Ask your Atlas representative where you can observe this stripping practice. See if it can be adapted to your conditions.



How KIRKVILLE COAL COMPANY solved split coal seam problem

and reduced ash content with SKOOPER loading...



Study the diagram. You'll quickly see the coal-clay-coal loading obstacle at one of Kirkville Coal Company's open pit mines in Missouri, near the Iowa state line. The 2-inch layer of clay splits a 36-inch vein of high-quality bituminous coal. Mixing in clay during coal loading causes too high an ash content . . . lowers B.T.U., and reduces market price.

As President C. E. Hanson puts it:

"Split veins in this area have always made it all but impossible to remove coal without getting a high percentage (7 to 8%) of ash due to the clay seam. Standard shovels with coal-digging buckets heeled into the clay, while tractor-type and 4-wheel-drive front-end loaders constantly dug into the clay with their tractive systems."

He further reports . . .

"Koehring Skooper proved to be the ideal machine for the job. With its 7-foot level crowd, clean coal can be shaved off with 2% less ash." What's more ... Skooper's powerful break-out force, coupled with level crowd action, makes digging the coal an easy job. Consider this, too ... Skooper's 2-yard bucket (on basic ½-yard machine) takes full advantage of only 64 horsepower ... makes the most efficient use of the little fuel it consumes! That's because, with Skooper's unique "standstill" loading cycle, full engine power is concentrated on the digging effort ... and not on unnecessary traveling.

5 months with no down-time

"Since the start of our busy season 5 months ago, the Skooper has worked 8 hours a day, at least 5 days a week without a single hour's down-time," Mr. Hanson reports . . . and adds, "For coal digging and loading, I feel that it's the most efficient equipment on the market!" Isn't it time you tried Skooper? Call Koehring distributor, or write us about it today.

KOEHRING

DIVISION OF KOEHRING CO.

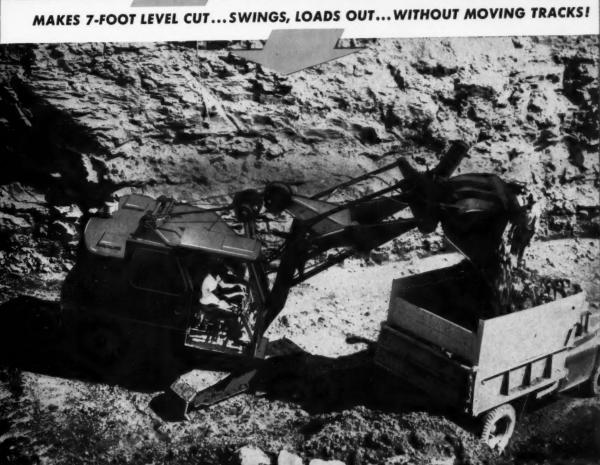
Milwaukee 16, Wis.

There's nothing like it ____ on wheels or tracks!

Koehring 1205 strips Kirkville coal

Working just ahead of Skooper at 3,000-acre Kirkville mine, this Koehring® 1205 is stripping approx. 24 feet of overburden. Materials range from common earth and clay to shale and ledge rock. 1205 output? About 4300 yards per 16-hour day! It's equipped with 3-yard dipper on 40-foot boom, 30-foot stick . . . has been stripping at Kirkville mines for over 2 years.







MORE A-C POWER where you need it-



You can put a-c power to work quickly . . . safely . . . profitably, at voltages up to 7½ kv, with new, heavy-duty PLM Cable Couplers. They give plug-in convenience for connecting and extending power cables, as needed, for shovels or other equipment. They're built, electrically and mechanically, expressly for open-pit and deep mining service. They enable wider use of the many

benefits of a-c power in higher distribution and utilization voltages.

PLM Cable Couplers are supplied for flange, foot or sled mounting as standard plug and socket, or as 2, 3 and 4-way junction box assemblies. High-strength cast aluminum housings—electrical and/or mechanical safety interlocks. Can be applied directly to cable in the field. Write for bulletin. PLM Products, Inc., 3881 W. 150th St., Cleveland 11, Ohio.

7½ kv 300-ampere COUPLERS

Patents (Continued)

prime mover, four traction wheels, and differentially driven output shafts connecting the prime mover to the front pair of laterally spaced wheels and the rear pair of laterally spaced wheels. An improved method is provided for supplying liquid under pressure to the hydraulically operated manual lock-up means. No. 2,927,654.

Conveyor idler stand, S. C. Moon (assigned to The Jeffrey Mfg. Co.), Mar. 8, 1960. In an improved idler stand for use with conveyor belts, the stand has brackets for supporting an idler roll, and includes a troughing idler formed by three idler rolls arranged in the described manner. The brackets can be readily assembled and disassembled on the idler stand. No. 2,927,681.

Preparation Facilities

Glogora Coal Co., Boone County, Blue Pennart, W. Va.—Purchase authority granted to The Daniels Coal Co. for complete DMS dense-media coal preparation plant. Capacity about 400 tph. Completion expected in May, 1960.

Winding Gulf Coals, Inc., Riffe Branch tipple, East Gulf, W. Va.—Contract closed with Fuel Process Co. for M-7 heavy-media washing plant addition, including pumps, sumps, screens, structure and accessories. To treat 6x¾-in coal plus ¼x8-in mesh air plant middlings. Capacity 170 tph. Completion scheduled May 16, 1960.

Clinchfield Coal Co., Moss No. 2 preparation plant, Clinchfield, W. Va.—Contract closed with Link-Belt Co. for froth flotation addition including two 6-cell flotation machines to handle an additional 42 thp (present capacity 600 thp). In addition, order closed for addition of a fifth centrifugal dryer and modifications to feed and collecting equipment to handle 4x65-mesh coal. Plant capacity, 600 tph. Dryer capacity, 300 tph.

Winding Gulf Coal Co., Maben, W. Va., plant—Contract closed with Eimco Corp. for one 8 ft 10 in 11-disc Agidisc vacuum filter.

Island Creek Coal Co., Algoma mine, North Fork, W. Va.—Contract closed with Link-Belt Co. for four Double-Deck concentrating tables, two 5-cell froth flotation machines and a "Fluid Flo" heat dryer. To handle %x0 fine coal. Scheduled completion, Sept., 1960.

Clinchfield Coal Co., Moss No. 2 cleaning plant, Clinchfield, Va. — Contract closed with Western Machinery Co. for twelve 66-in Fagergren flotation cells for use on minus 28 mesh fines. Capacity, 2,500 gpm, 7 to 9% solids. Completion scheduled for May, 1960.

IN MINERS ELECTRIC CAP LAMPS -

The RIGHT SPOT is the WHEAT SPOT

every time!

Every time you turn the switch on the Wheat National, you get a perfect spot. The exact, bright-centered spot you want, made to suit your needs, from either filament!

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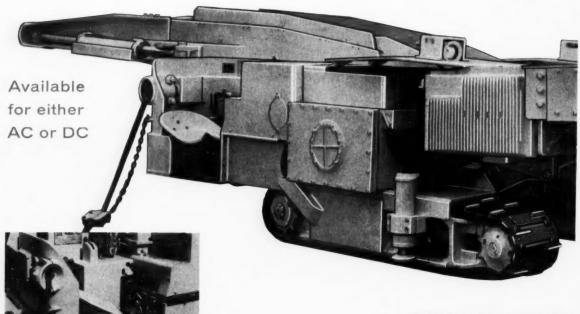
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NATIONAL MINE SERVICE CANADA LIMITED

LIGHTWEIGHT COST plus HEAVYWEIGHT equals PRODUCTION



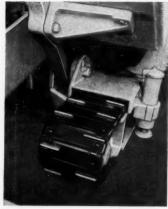
OPERATOR'S PLATFORM

Compact and convenient hydraulic and electrical controls are within easy reach of the operator. Throttle valve precisely controls the speed of all hydraulic operations as well as providing "deadman" control.

16" WIDE CRAWLER

The new crawler with heavyduty gearing can operate the miner on steep grades and also float on soft bottom.

Less than 25 P.S.I. ground pressure.





GATHERING HEAD

The exclusive "dual gathering arms" provide maximum reach and much better flow to the conveyor.

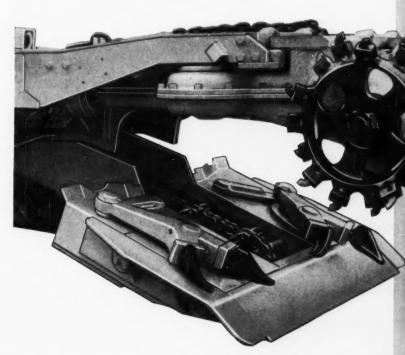
PERFORMANCE PUNCH

Lee-Norse

CM38

and

CM48



CUTTING HEADS

New "Rap-Lok*" Cutter Bits, spaced evenly around cutter rim, provides smooth, vibrationless performance. Extremely quick "bit change"-no set screwslong bit life.



cutter-action that cuts 42" to 120" seams and gathers loads as fast as they are cut

29 TONS with

power-smooth

*Trade Mark of The Cincinnati Mine Machinery Co.



Lee-Norse Company CHARLEROI, PENNA.

Specialists in Coal Mining Equipment

Coal high or low?... Lee Nowe MINERS keep production on the go!

Coal Abroad

Set Drill Record After Tragedy

Workers fought against time . . . established records in sinking shaft to reach miners trapped Jan. 31 in a South African mine by a subsidence.

ALTHOUGH it was almost certain that all of the 435 coal miners trapped by a subsidence Jan. 21 in the Clydesdale mine, Orange Free State, South Africa, were dead, drilling continued recently in an attempt to put down a 12-ft diameter

Rugged Joy Chains just can't be beat. They cut more coal, and make your machines run smoother—with less maintenance. Like all Joy parts, chains are ready for immediate shipment from completely stocked parts depots in every major mining area.

GENUINE JOY PARTS AVAILABLE AT 11 LOCATIONS:

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JOY MANUFACTURING COMPANY

shaft in the vicinity of the victims.

The plan has been to sink the shaft 530 ft through overburden to a point in the coal near where the men were working so as to be able to drill back through the coal into the accident area.

Experts calculate that the work done in the first 10 days—from the day the preliminary equipment was hurried to the site to the time when the 80-ft deep concrete-lined shaft was handed over to a team of high-speed drillers — was equivalent to that which would take from 4 to 6 weeks in the normal course of high-speed shaft sinking. The record performance was achieved through unstinting cooperation between the whole South African mining industry, private companies, government agencies and individuals.

Playing Golf – Harry MacConachie, consulting engineer at Anglo American Corp., was on the golf course in Johannesburg when he received word of the cave-in. Within minutes, he was on his way to the scene to meet with other engineering experts and technicians to draw up plans for reaching the men.

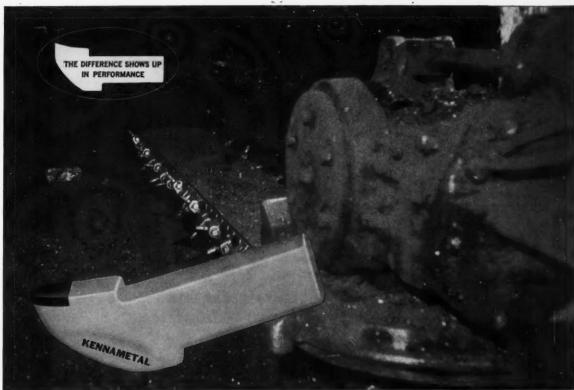
Day and Night—By dawn, on Monday, Jan. 25, trucks and trailers were converging on the colliery bringing the needed help. Anglo American Corp.'s Central Training unit, at nearby MacCauvlei, was prepared overnight as a center to provide accommodations and meals for the sinking crews, technicians and private firms. From then on, it was a case of working day and night, fighting against sleep and the elements, as well as more subsidence in the mine.

Full Aid—From all over the world came offers of service or equipment. Several companies even made special equipment on a round-the-clock basis. Compressors were readied, the headgear was completed and erection of hoists got under way. A powerline was laid with remarkable speed by the Electricity Supply Commission, and telephone communications were set up by the Post Office.

On Tuesday, Feb. 10, erection of a winding engine was complete and all equipment and the stage hoist were passed as ready for operation. The Galloway stage was slung into the shaft, which was by then down to a depth of 80 ft and fully concrete-lined. Full-scale speed-drilling could commence. Six weeks work had been accomplished in 10 days. But as Coal Age went to press it was learned that further attempts to reach the bodies of the trapped miners were being abandoned because of impossible working conditions in the mine.

Overseas Flashes

CHINA—Communist China's Peking radio announced that a new coal-dressing plant capable of handling 1.5 mil-



Kennametal U4 Bits installed on the 9-foot bar of a universal cutter

Fast cutting KENNAMETAL U4 Bits cut 30% more places every shift

Using other bits, 10 or 12 places a shift was the best that two men could cut from the Lower Kittanning Seam near Philippi, West Virginia. Seam thickness averages 44 inches, with rooms being driven 20 feet wide.

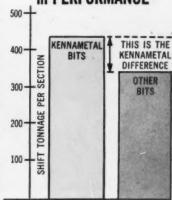
Despite the rolls of fire clay that make undercutting difficult, a switch to Kennametal U4 Bits increased the average to 16 places a shift. They have cut as many as 21 a shift.

As indicated by the graph, increased production has made a big profit difference. Bit costs have dropped too...down to 1.4 cents a ton. And the company reports less fines and reduced wear on the bit blocks.

Let the Kennametal difference show up in performance at your mine. Your Kennametal Representative will help you select and actually test Kennametal bits in your mine. You can't judge performance by appearance or a price tag. Call him, or contact us direct. Kennametal Inc., Mining Tool Division, Bedford, Pa.

- Consistently high quality keeps Kennametal bits in service longer...resulting in fewer bit changes and more operating time at the face.
- Free-cutting design of Kennametal bits draws less power, permits faster cutting, maximum production, less maintenance.
- Every Kennametal bit is backed by 21 years of leadership in tungsten carbide tooling, including the development of the first carbide cutter bits for the American mining industry.
- Nineteen full-time Kennametal Representatives and the Kennametal Distributors—leading mine supply companies, provide assistance in solving your cutting and drilling problems . . . the tools you need . . . when you need them.

The difference shows up in PERFORMANCE



For this mine, Kennametal Bits mean the difference between 324 tons and 432 tons ... 108 tons from a section, every shift!



KENNAMETAL
...Partners in Progress



ELLINE

103 ways Cyanamid serves the coal industry...better

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Whatever the nature of the seam, Cyanamid offers a permissible that enables you to produce more coal for less money. The American line includes a variety of low, medium and fast rate powders with a variety of densities. Our experienced explosives engineers will be pleased to help you select the proper grade for your particular requirements.

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To permit you to benefit from the advantages of multiple blasting, Cyanamid manufactures COAL KING Split Second Delay Caps in 15 delay periods, each available in a variety of leg wire lengths. Like all Cyanamid Electric Blasting Caps, COAL KING iron leg wires are insulated with 4 concentric layers of vinyL plastic to assure dependable, safe performance.

76 OFFICES, PLANTS and MAGAZINES FOR PROMPT SERVICE!

Cyanamid's nation-wide network of plants and magazines closely parallels U. S. coal operations. Consequently, you can rely on Cyanamid for dependable delivery and prompt assistance with blasting problems.

For additional information on Cyanamid's COAL KING Caps, permissibles and blasting accessories, contact our nearest office.

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BOSTON FLAMEOUT 200* — Single-ply, flame resistant belt with maximum impact resistance, outstanding edge wear, and fastener holding strength. Has neoprene covers. No slipping on pulley. Improved wear-resistant cover available in any thickness. Ideal for panel and continuous miner installations.

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BOSTON SUPER BOSTRON - Balanced Belt Construction, with Dulon or Flameout covers for severe impact and high tension belts. Ideal construction for longest service life on slope conveyors. Strong, thin carcass allows smallest diameter rolls for low coal removal. Carcass will not rot or mildew.

BOSTON FLAMEOUT* — Balanced Belt Construction for permanent underground installations and main entries having special tension requirements.

*Fire-resistant — maximum underground safety. Meets standards of U. S. Bureau of Mines Acceptance Designation No. 28-9.

Whatever your requirement, BOSTON has the right belt for the job — assuring you longer belt life . . . less trouble in service . . . greater economy!



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Coal Abroad (Continued)

lion tons of coal annually has gone into operation at Hokang, in Heilungkiang Province, northeastern China. The report said the highly-mechanized and automated plant with remote push-button control was designed and equipped by the USSR. It has a complete belt-conveyor system which carries coal from the mine to the dressing plant and from the plant to the railhead. According to Red China's National Statistics Bureau, the 1959 production of coal was 348 million tons, an increase of 29% over 1958.

JAPAN—Yawata and Fugi, two of Japan's major iron and steel companies, are reportedly contemplating having an American trading firm order three to five cargo ships of about 45,000 deadweight tons each, for use in importing coal from Hampton Roads, Va. Belief is the Japanese firms believe it might be cheaper than building their own ships with interest rates currently quite high in that country.

RUSSIA — A new self-propelled plate link conveyor has been developed in this country. It differs from usual Russian designs in that it is self-propelled and flexible permitting either vertical or horizontal direction change. It moves on electric motor-driven wheels and achieves its flexibility by means of a double link connecting between the chain links of the hauling chain. Tractive stress during relocation is said to be about 5 times smaller than in customary conveyors, facilitating the use of a less powerful motor.

POLAND-An ultra-sonic dust collector for zincoxide dust, probably applicable to other types of dust, has been designed in Poland. Dust-containing air is blown by a fan into a tower where it passes an acoustic field formed by a siren installed in the upper part of the tower. The air flows through the tower in the opposite direction to allow spreading of the sound waves. Most dust particles are settled in the lower part of the tower, while a small portion is blown by the air into a cyclone (low-pressure area), where the dust is separated from the air stream. Below the cyclone there is a container for the removed dust.

BRITAIN—The government of this nation has until late stressed a policy of leaving fuel users freedom of choice in fuel policies. But it is known that the government is pressing the electricity board to cut back the amounts of oil it takes. This could be done by either a reduction in quantities or extension of deliveries under existing contracts. Long-term contracts between the central electricity generating board and several American oil companies, including Shell

and Esso, are evidently in danger of being modified downward or being stretched out. With tremendous surpluses of coal on its hands, the British coal board has been keeping after the government to press for conversion of oilburning power stations to coal burning.

GERMANY—The Soviet Union will provide West Germany with major petroleum supplies during 1960 under an agreement reportedly signed in Moscow Feb. 25. The Germans are understood to have accepted contingents for Soviet supply of about 25% of their gasoline imports. Increased quotas for petroleum products were designed to balance Soviet willingness to forego coal shipments to coal-glutted Germany. The protocol signed in Moscow covers the third year of a 3-yr governmental agreement signed in Bonn, April, 1958, to exchange \$163 million in goods for 1960.

Equipment Approvals

February

Joy Mfg. Co.—Type 14BU10-1BH loading machine; five motors, two 25 hp, two 7½ hp and one 6 hp, 440 V, AC. Approval No. 2F-1532A, Feb.

Ensign Electric & Mfg. Co.—Type KL, J, G, G, distribution box; four breakers, one 400 amp, one 225 amp and two 100 amp, 220-/440 V, AC. Approval No. 2F-1533, Feb. 2.

Lee-Norse Co.—Model CM48-IE continuous miner; three motors, each 50 hp, 440 V. AC. Approval No. 2F-1534A, Feb. 8.

Lee-Norse Co.—Model CM38, continuous miner; three motors, each 50 hp, 440 V, AC. Approval No. 2F-1535A, Feb. 9.

Joy Mfg. Co.—Type X849-66 conveyor drive unit; one motor; 75 hp, 250 V, DC. Approval No. 2F-1536, Feb. 17.

Henger-Seltzer Co., trensferred to G. T. Products, Inc.—Models A-2M and A-3M flashlights. Approval No. 10C-623, Feb. 17.

Henger-Seltzer Co., transferred to G. T. Products, Inc.—Models K-2 and K-2M flashlights, Approval No. 10C-612, Feb. 17.

The Long Co.—Mobile bridge conveyor; one motor, 25 hp, 550 V, DC. Approval No. 2F-1537A, Feb. 23.

The Long Co.—Types PT-218 and PT-220 Piggyback conveyors; two motors, each 5 hp, 550 V, DC. Approval No. 2F-1538A, Feb. 23.

The Long Co.—Types PT-218 and PT-220 Piggyback conveyors; two motors, each 5 hp, 220-/440-/550 V, AC. Approvals Nos. 2F-1539 and 2F-1539A, Feb. 24.

LARGE W. VA. MINE SAVES \$450 DAILY with 6 NOLAN Automatic



This is only one of many hundreds of satisfied and repeat order Nolan Automatic Loading Station users saving substantial money every day.

Let us tell you and show you why the Nolan

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John North Associates, P.O. Bex 105, Harbort, Mich. (Chicago District) Laviet Safety Limited, Toronto 10, Canada (from p 30)

450 miners, plus hiring of hundreds more for work in the plant itself, and others to work in related industries.

The plant would utilize the carbon content of anthracite for production of other chemicals. Some 350,000 tons of coal per year would be needed for this phase of the operation, while the remaining 150,000 tons per year would be used to operate a steam plant for the production facility.

Mr. Bradbury said the carbon utilization process has been widely tested and found feasible with tests on a large scale being made now to further develop the program. Studies are under way for use of anthracite and iron pellets, which if practicable, would open a new era of use for hard coal, it was added. Success in obtaining the plant hinges on meeting the competition of coke.

As we went to press, rumors were flying that Albert A. List, chairman of Glen Alden, might be planning to sell out his interest in the corporation. Mr. List became chairman when his List Industries, a corporation with diversified interests, was merged with Glen Alden. The rumors were quickly denied.

will be a wholly-owned subsidiary of Princess Coals, operating as the Sewell Div. William Crawford, vice president, operations, Princess Coals, will take charge of the newly-formed division. Irvin C. Spotte becomes general manager of the Sewell Div., while Gene Matthis moves from Princess Elkhorn, where he was general superintendent, to Williamson as general manager of the Sycamore Div. Raymond Bradbury, formerly director of industrial engineering, succeeds Mr. Matthis as general superintendent of the Princess Elkhorn Div., and H. B. Price become general manager of the Powellton Coal Div., advancing from the general superintendent position.

Winding Gulf Coals, Inc., bought the East Gulf Pocahontas mine, Beckley, W. Va., from The North American Coal Corp.

Winding Gulf, major producer of Pocahontas No. 4 and Beckley seam coals, thus diversifies its operations with addition of North American Pocahontas No. 3 coal. North American will continue to operate the Southern Div.

Utilization

United States Steel Corp. joined Food Machinery & Chemical Corp. in a plan to build a research facility for experi-

Mines, Companies

Princess Coals, Inc., purchased the Sewell Coal Co. The latter firm operates the Panther mine at Marybill, W. Va.

Sewell, with output of 1 million tons,

Bituminous Output

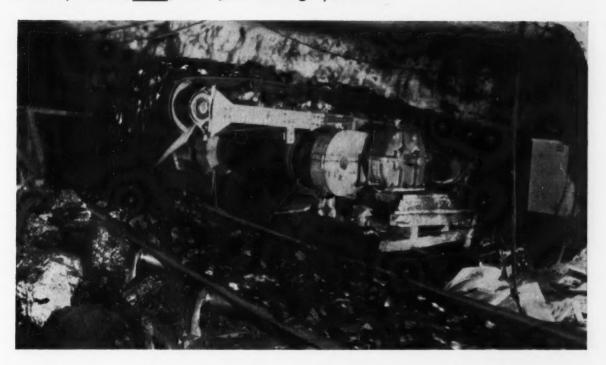
Anthracite Output

YEAR TO DATE PRODUCTION
March 19, 1960 4,203,000
March 21, 1959 4,823,000
1960 output 12.9% behind 1959.
A month earlier output was 19.6% behind 1959.

WEEK ENDING PRODUCTION
March 19, 1960 388,000
March 21, 1959 361,000



Better products, faster, from your Bearing Specialist:



Where output counts, you'll find Bower Spher-O-Honed roller bearings on the job



Be sure your replacements call for Bower . . . the bearings with the high availability record

Among mine operators, Bower tapered and straight roller bearings continue to prove their superiority under all types of loads.

The design of Spher-O-Honed tapered roller bearings insures better lubrication, smoother surface for less friction under load and longer life. Another important reason for making all replacements from the Bower line is availability second to none in all sizes you need. Contact your bearing specialist whenever replacements are due. He's always nearby to help with the right sizes and types for the job.

BOWER ROLLER BEARINGS

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DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC. . DETROIT 13, MICHIGAN







At last! A truly comprehensive book on belt conveyor idlers that answers all your questions. The new Hewitt-Robins "Belt Conveyor Idlers" book is one of the most complete ever offered to industry. In it you'll find:

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- Answers to questions frequently asked about idlers.
- Engineering information on belt speeds, conveyor capacities, idler spacing, and other factors you must consider in selecting idlers.
- Complete explanation of 14 basic types of idlers manufactured by H-R to fit every belt conveyor need.
- Tips on how to extend the life of idlers.

For your copy, consult your H-R representative, or write Hewitt-Robins, Stamford, Connecticut. Ask for Bulletin 4-49.



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Model 705-BDT 70-Ten Payload

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Your operation is in for Smooth Sailing when KW-DART is on the job. Greater loads for less cost is the consistent record of the 70S-BDT in strip mining operations. It is powered for steep grades and close quarters in the pit and smooth, high performance on the haul road.

Builders of heavy duty trucks exclusively since 1903

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160

"We particularly like the snappy action and control accuracy of the TD-25's front-mounted winch," report the Walls Brothers, Wolf Ridge Coal Co. Their "25" has a key job, helping strip 35-ft. earth, shale and sand rock overburden from a 4-ft. seam of coal.

"THIS NEW TD-25 REALLY HAS IT for overburden stripping"





C. M. and Reid Walls,

"We have had eight years of fine service using International TD-24's," report the Walls Brothers, for Wolf Ridge Coal Company. "Our faster and easier starting new TD-25 really has it for mountain overburden stripping operations.

"The '25's' turbocharged diesel engine governs instantly to load increases, giving the power to carry full blade loads right on through without lug-down. The TD-24's, and now the TD-25 have proved to us that the live power-turning feature moves more overburden, and gives top operating safety."

Of all king-sized crawlers, only the new 230-hp International TD-25 has Planet Power-steering. This

Another duty of the TD-25—shattering coal with the two-standard Ateco ripper to size the coal and speed load-out. "We've used International TD-24's since '51 with continuous operation, good service, minimum repairs," add the Walls Brothers.



Wolf Ridge Coal Co., Oliver Springs, Tennessee

is the only planetary system engineered and located to give you the dual advantages of "live track" power-steering; plus on-the-go, Hi-Lo power-shifting that does away with steering clutches.

Planet Power-steering eliminates load-limiting "dead-track drag"—gives you full-load pull-power on turns as well as straightaways. And Hi-Lo power-shifting does away with time-wasting "gear-shift lag"—gives on-the-go matching of power to load, for full-speed cycles.

Rip-snorting turbocharged power

Press the direct-start button, to command the "25's"

rip-snorting, free-breathing diesel horsepower! Dual valving of the "25's" high-torque DT-817 engine provides for peak turbocharging efficiency—to deliver full-rated performance from sea level to timberline!

Prove what it means in bonus capacity to get the double-barreled advantages of power-steering and power-shifting—in a finger-tip-controlled crawler with DT-817 diesel wallop! Measure the extra value of getting years-proved Planet Power-steering (along with Hi-Lo power-shifting) as designed-in, built-in basic standard equipment. Compare performance—see what's behind TD-25 ability to outearn king-sized clutch-steered crawlers up to 50% on overburden removal, land-clearing, high-walling and other tough mine and quarry jobs. Let your International Construction Equipment Distributor demonstrate!

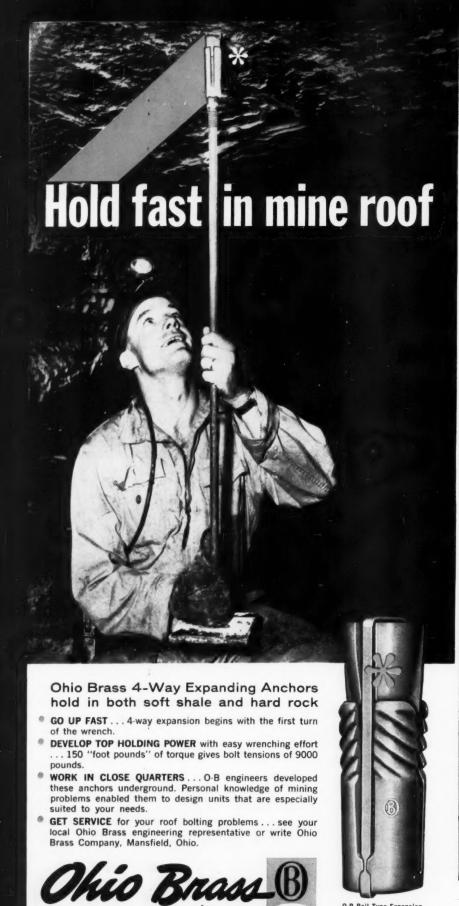


Here's your 76-page cost and production estimating book—newest, most authentic and complete guide for estimating material-moving costs—and for selecting equipment combinations for top profits, anywhere! Yours for the asking from your International Construction Equipment Distributor!



International® Construction Equipment

International Harvester Co., 180 North Michigan Ave., Chicago 1, Illinois A COMPLETE POWER PACKAGE



News Roundup (Continued)

mental production of metallurgical coke from sub-bituminous coal, near Kemmerer, Wyo.

The test plant, to be operated jointly by the two firms, is scheduled to start operation late this year. It will conduct experimental work on a new coking process developed by Food Machinery in recent years for using Wyoming coals.

P&R (Continued from p 28)

gas, at ever escalating prices. We have in our silt and refuse reserves approximately 1400 trillion usable Btu's of energy, since our power plant and other facilities will be immediately adjacent to these full stock piles. We have the advantage of all these Btu's in place at no cost with no concern about raw material price escalation as the years unfold.

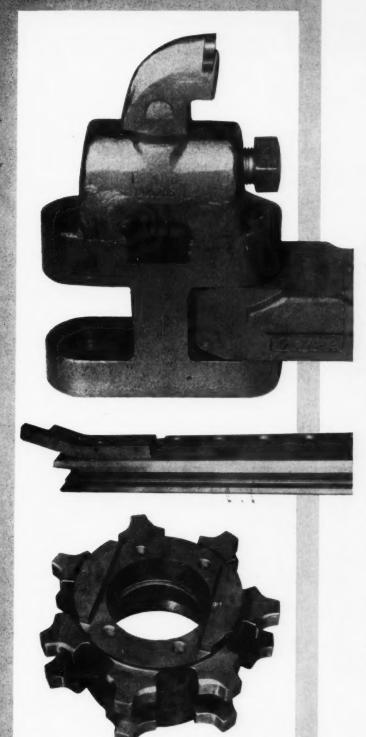
"The second unique aspect of our venture is that we shall use two manufacturing process which, although they are in widespread industrial use in other countries, have not hitherto been used in the United States. These are the Lurgi process, for making synthesis gas and the use of anthracite alone instead of coke in the making of calcium carbide.

"One of the facts which makes our proposed use of the Lurgi process economically attractive as well as technically sound, is that the process consumes a great deal of oxygen. Today, oxygen can be furnished at only one fourth of its cost some 10 yr ago. This occurs because the art of air separation has been made increasingly efficient to meet the growing demand of our steel industry. The great rise in the cost of natural gas, together with the cost of oxygen, would have obvious revolutionary implications if it occurred overnight. It has occurred gradually over a period of years but its significance is, nonetheless, revolutionary.

"Another technical fact worthy of note here is that the Lurgi process works efficiently only with non-caking fuels. It will work with coke, but coke is expensive. It also works with anthracite. The Lurgi process is not suitable for American bituminous coal which is strongly caking. To appreciate the significance of this, you must remember that anthracite and bituminous do not differ only in so-called hardness. They differ both chemically and physically. Chemically, bituminous contains a lot of volatile matter such as oils and tars; anthracite does not. Physically anthracite differs from bituminous in having a higher ash-fusion temperature. It does not tend to form the clinkers which are the plague of bituminous gasification.

"I mention these semi-technical details for a good reason. Many people have FOR USE ON BORING TYPE MINERS

1ST IN THE FIELD — 1ST IN EFFICIENCY!



TRIMMING CHAIN COMBINATION TOPS 'EM ALL

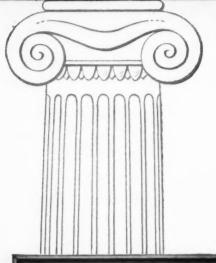
HERE'S A CINCINNATI EFFICIENCY-PROVED AND MINE-TESTED COMBINATION consisting of the popular Cincinnati Trimming Chain . . . Trimming Chain Guides and Sprockets. This Cincinnati Chain for use on boring type miners is designed to utilize the full potential of your highly productive mining machines. Cincinnati Chains are made of drop forged alloy steel components coupled with extra large wearing surfaces. Specially designed and manufactured to exacting standards of CINCINNATI MINE, this chain is the finest and most widely used trimming chain available to the coal mining industry.

THIS CINCINNATI TRIMMING CHAIN GUIDE with its specially designed Sprocket Scraper, a feature pioneered by CINCINNATI MINE, is gaining in popularity wherever used. The Cincinnati Sprocket Scrapers on Cincinnati Trimming Chain Guides greatly minimize down time due to sprocket and guide failures. For the best in trimming chain guides . . . it's "CINCINNATI".

OR maximum life and top efficiency, we recommend that only CINCINNATI SPROCKETS be used with CINCINNATI CHAINS. Made from a solid drop forging embodying all the features characteristic of Cincinnati Sprockets, these trimming chain sprockets assure perfect tracking of the chain and long sprocket life.

THE CINCINNATI MINE MACHINERY CO.

HAULS





U. S. CONVEYOR BELTS

"A revolution in strip mining," says superintendent, "U.S. Conveyor Belt helps us save \$1500 per week."

The Will Scarlet mine near Stonefort, Ill., has an outstandingly successful use of the first overland belt conveyor in a strip mine. The conveyor belt system, using a U. S. Giant® Belt, reduces the number of trucks, eliminates extra roads and high maintenance costs. The belt makes possible economical stockpiling for continuous operation: miners can continue working without a tipple operation - or the tipple can produce without a mining operation. The system can be moved to any location on the 3,000-acre tract. As the pit progresses overland, more lengths are simply added to the belt. "Maintenance costs are very low. Our savings are \$1500 per week. We intend to install additional 'U. S.' Belting soon." Another Three-Way Engineering Triumph.

TERE ARE on-the-job stories of five United States Rubber Conveyor Belts, taken from "U.S." belt records in the coal mining industry.

These belts are just some of the "U.S." standouts which demonstrate, year after year, why "U.S." is the world's largest producer of conveyor belts.

For steady, day-in and day-out dependability in conveyor belting, it always pays you to secure the advantages of "U.S." Engineering. "U.S." Engineers work directly with "U.S." Distributors or original equipment manufacturers to assure their obtaining the right belt. recommendations for each type of conveying.

The most comprehensive belting engineering information in the industry is available through your "U.S." Distributor. It will pay you to check with him.

Visit famous U.S. Tipple Inn, Penn-Sheraton Hotel, Pitts., Pa., May 8-10.



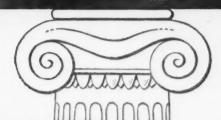
says plant foreman

Mf. James Campbell of Guyan-Eagle Coal Co., Kelly, West Va., knows why Guyan-Eagle has been using (and replacing with) "U. S." belts in their 5 mines. In the words of the company's own officials, "U. S." Belts are:

"The most dependable in our experience."

"Resistant to abrasive action of rock." "Strong, durable-maintenance is minimum."

FAME





40,000,000 tons of washed coal

This is the minimum tonnage expected to be hauled in an estimated 12-year life by the main "U.S." belt. Installed in U.S. Steel's Robena Coal Mine, Uniontown, Pa. Robena is three mines, serviced by the same preparation plant. It is oné of the largest coal-producing units in the nation. A single U. S. Rubber slope belt (installed 1953) conveys all the washed coal, amounting to over 20,000 tons a day. An earlier "U. S." Belt (installed in 1951) conveys coal to the blending bins.



AUTOMATION GOES UNDERGROU

"U. S." Belts help make foolproof the push-button conveyor system in the Dana Slope Mine of Amherst Coal Co., (Rensford, West Va.).

Limited storage capacity, both inside the mine and on the surface, makes it mandatory that this slope conveyor operate without stoppage. So Amherst, knowing the "U.S." reputation for dependability and long life, selected a 42" U.S. Giant 6-ply YN belt. Operating since 1952, it has given completely trouble-free service.



Jones & Laughlin preparation plant at La Belle, Pa., is one of the world's largest. Here outputs from Vesta and Shannopin mines are combined.

Coal from the Vesta is carried across the river on a 3870-foot U.S. Rubber Conveyor Belt supported by the world's longest belt conveyor suspension bridge. This belt (actually all the belts in the system are "U.S.") has been operating since 1948 without a breakdown. In these eleven years it has carried a total of 44 million tons so far.



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In Canada: Dominion Rubber Company, Ltd.

been misled by the fact that certain major chemical companies have met with costly failures in attempting to gasify coal in recent years. How, then, can P & R succeed when these large experienced companies failed? The answer is first that we are using anthracite not bituminous and second we are using a form of anthracite, let us not forget, which costs us nothing. Last summer we shipped 3,000 tons of our anthracite feedstock to Germany for gasification in full-scale commercial Lurgi plants. This material was gasified without the slightest difficulty with even better economic results than had been anticipated. Our other basic process for making calcium carbide which, as you know, yields acetylene, the fundamental building block for a large and growing group of chemicals, was likewise tested in a German built commercial installation, last summer. The process is basically the same process which Union Carbide Co. has used for half a century. The only difference is where the American carbide industry has traditionally used coke as its main source of carbon, we expect to use anthracite exclusively.

"These tests last summer in Europe resulted in excellent economic as well as technological performance with good yields of high grade carbide. One reason why in America coke has been preferred in carbide production is because it was formerly cheaper than anthracite. The principal ingredient in carbide in terms of cost is electric power, so that the carbide industry gravitated to locations, such as Niagara Falls and the Tennessee Valley, far away from the anthracite region, in order to obtain cheap power. But the cost of making coke has been rising and the cost of hauling coke has also been rising. With cheap power right at the carbon source, our Pottsville area is a logical location for a carbide plant.

"I have been asked why we are so certain that a silt-burning power plant is feasible; why we are contemplating with such assurance the commitment of \$50-\$60,000,000 in a \$00,000 kw-power station. Again, this phase of our proposed operations is not merely an intriguing theoretical idea. A power plant similar to that which we contemplate has already been pioneered and successfully operated by the Pennsylvania Power & Light Co., Holtwood, Pa. At that location, the PP&L has been operating its 105,000 kw power plant at a cost under 3 mills per kwh.

"I hope that all the foregoing has helped to make the point that although our chemical venture is large in scope it is based upon simple economics and simple technology. It is not based on any untried processes; it is not based on laboratory or pilot plant work. It is not based on hopes and visions, but is founded firmly and solely upon proven commercial technology.

"Included in the job of security analysts is a projection of future earnings. But the amount of our chemical earnings is something that I will not predict today. All I can say is that we are confident of making a good profit, and we most certainly are not going into this or any other new venture unless we can see the definite promise of a minimum return of 15% net after taxes on our equity.

"Many companies have gone into the chemical business in recent years because it has growth, glamor and sex appeal. We have not been motivated by any such romantic notions, which often prove to be illusions. We did not look about and choose to go into the chemical business because it was a more glamorous or popular business than men and boys' underwear. It all began because of our ownership of tens of millions of tons of carbon above ground. Our chemical business will be simply a means of liquidating these great inventories of raw materials. turning them into cash by using routine commercial processes. . . .

Meetings

West Virginia Coal Mining Institute, spring meeting, April 22-23— Morgantown, W. Va.

American Mining Congress, 1960 Coal Convention, May 9-11—Pittsburgh, Pa.

Charbonnages de France, International Conference on Strata Control, May 16-20, 1960. Presentation of results obtained from laboratory experiments and underground measurements and observations—Paris, France.

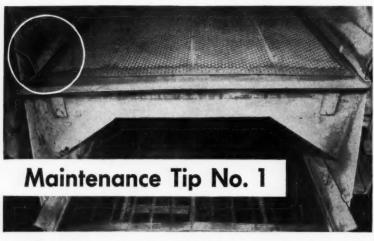
Fourth International Congress on Coal Preparation, May 28-June I— Harrogate, Eng.

Gordon Research Conferences, Chemistry of Coal, June 13-17—New Hampton School, New Hampton, N. H.

Appalachian Underground Corrosion Short Course, June 1-3, 1960. Fifty-seven classes, 15 new papers and 25 new speakers—West Virginia University, Morgantown, W. Va.

Mine Inspectors' Institute of America, Louisville, Ky., June 12-15.

National Safety Congress, 48th annual meeting, Oct. 17-21—Conrad Hilton Hotel, Chicag.



GRIPPER EDGES ON VIBRATING SCREEN SECTIONS

Is the gripper or flange design right for your vibrating equipment? Are the flanges held parallel? Is the radius of the flange hook correct? Does the cloth lie flat? Are the ledges clean? Is the tension drawn on the screen section squarely? Check these points carefully to correct gripper edge problems. Call Cleveland Wire Cloth for valuable assistance and top quality vibrating screen section cloth.

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RESULT: Better working conditions

for men and equipment

*A quick, easy-to-use support for cables, conduit and pipe.

The O-B roof plate hook installs with one hammer blow.

- . CLEARS MINE BOTTOM FAST AND EASY . . . cables, conduits and pipe go out of the way overhead leaving a clear way underneath for men and machines.
- PROTECTS ITS LINES FROM DAMAGE . . . saves costs because cables and other such valuable linage are held out of the way of wheels and feet.
- . THESE HANDY HELPERS CAN BE USED OVER AND OVER AGAIN . . . once a section has been worked out . . . roof plate hooks can be reclaimed as easily as they were installed. This easy-to-use support moves with your operation! Order them from your O-B representative when he next stops at your mine. O-B Roof Plate hooks will make your mine operation safer and faster.

OHIO BRASS COMPANY, MANSFIELD, OHIO-Canadian Ohio Brass Company, Ltd., Niagara Falls, Ontario.

EXPANSION SHELLS AND PLUGS AND CONTROL EQUIPMENT . ELECTRIC HAULAGE MATERIALS

DODGE HAS MORE PROVED BEARINGS THAN YOU HAVE BEARING PROBLEMS!

bearings—bearings that have been proved in thousands of installations similar to yours. You benefit by getting known dependability; and you get the important savings of high quality at production price.

PIN-POINT SELECTIVITY

Dodge has supplied mounted bearings to industry for over three-quarters of a century. Dodge bearings have always kept pace with improved production practices. Each new condition of service has been met by Dodge as it has arisen, with the result that the Dodge line contains mounted bearings to meet almost every service requirement with pinpoint accuracy.

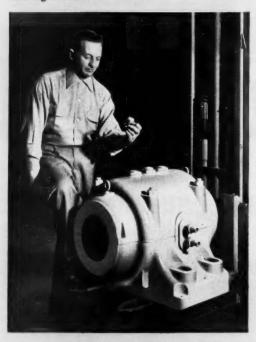
High load, high speed, excessive dust, moisture, corrosion, high or low temperatures, continuous operation—you name it!—such conditions and their combinations are met every day with Dodge bearings.

BROAD LINE-WIDELY DISTRIBUTED

In the great variety of mounted bearings developed by Dodge, you will most likely find the precise unit to fit your requirements ideally—without paying for features you do not need. And if your requirements call for several types of bearings, there is an advantage in having them of common design, such as Dodge offers.

The Dodge line is probably broader than any other line of mounted bearings in America. And of special importance to machinery manufacturers, it is the most widely distributed line. There is always a Dodge bearing of the right type and size near at hand.

You can check this with your local Dodge Distributor. Ask him—or write us for the Dodge Bearing Bulletin.



In addition to tapered roller, spherical roller and ball bearings, Dodge builds many types of sleeve bearings. Here is the "large and small" of the sleeve type bearings carried in stock—ranging from an 8-in. Sleevoll weighing over 1200 lbs. to a ½-in. solid journal bearing weighing 9 ounces.

DODGE MANUFACTURING CORPORATION, 3000 Union Street, Mishawaka, Indiana



DODGE PILLOW BLOCKS WITH TIMKEN TAPERED ROLLER BEARINGS



DODGE SPHER-ALIGN PILLOW BLOCKS
WITH SPHERICAL ROLLER BEARINGS



DODGE BALL BEARING PILLOW BLOCKS



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- Dodge Pillow Blocks with Timken Tapered Roller Bearings. America's quality pillow blocks. Assembled, lubricated, adjusted and sealed at the factory. 5 types for varying needs.
- Dodge Spher-Align with Spherical Roller Bearings. Rugged heavy duty, compact, inherently self-aligning. Exclusive Micro-Mount simplifies installation.
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- Dodge Sleevoil Pillow Blocks. Ultra quality . . . extra long life . . . accessibility . . . quiet. Plain or water-cooled.
- Dodge Bronzoil Pillow Blocks. Efficient, low cost pillow blocks with self-oiling, capillary bronze bushings. Self-aligning. Large oil reservoirs.
- Dodge Bronze Bushed Pillow Blocks. Quiet fan and blower pillow blocks with two bronze bushings of high lead content mounted in one cast iron housing.

- Dodge Journal Bearings Solid and Split. True running, dependable. Babbitted bearings with precision machined bores and faces. Finished bases.
- Dodge Heavy Rigid Pillow Blocks. Rugged, carefully bored, babbitted pillow blocks for many applications requiring grease lubrication. Finished bases and ends.
- Bearing Units. A wide variety—spherical seat, cartridge, flange, hanger, screw conveyor hanger, take-up. Ball, Roller and Sleeve types.



CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look under "Dodge Transmissioneer" in the white pages of your telephone directory, or in the yellow pages under "Power Transmission Machinery."

DODGE

of Mishawaka, Ind.



REINFORCED PRIMACORD

Textile reinforced, tough, resilient, flexible. Recommended for surface trunklines and deep holes where normal strength and resistance to abrasion and cutting are needed. Tensile strength 150 lbs. 1000-ft. spool 18.5 lbs. Colors: Red stripe on yellow.



PLAIN PRIMACORD

Textile-covered, flexible and resilient. Suitable for surface trunklines and shallow holes where tensile strength and resistance to abrasion and cutting are not required. Tensile strength 125 lbs. 1000-ft. spool 17.5 lbs. Color: Yellow.

PLASTIC REINFORCED PRIMACORD

Covered with tough plastic material, not affected by high Summer heat or Winter cold. Waterproof—resistant to acids commonly encountered. Use for extremely deep holes, river crossings, field shots that must stand for long periods of time and in other wet conditions. Tensile strength 275 lbs. 1000-ft. spool 21 lbs. Color: White.



to meet varying blasting conditions

Primacord is used primarily for initiating commercial explosives. It consists of a core of high explosive encased in various combinations of protective coverings. When initiated with fuse and cap or electric blasting cap, it detonates along its entire length at a velocity of nearly four miles per second and with the initiating energy of a blasting cap at all points. A Primacord trunkline will initiate any number of additional lengths through simple knot connections. In a downline it will detonate cap-sensitive explosives with which it comes in contact.

Primacord is less sensitive to accidental detonation than the main charge of standard explosives. On at least one occasion it failed to detonate when directly struck by lightning.



PLASTIC WIRE COUNTERED PRIMACORD

A strong, tough Primacord, armored with wire and covered with a plastic material. Recommended for use in deep, ragged holes or with metal or fibre explosives containers, where strength and resistance to abrasion and cutting are essential. Tensile strength 300 lbs. 1000-ft. spool 31.5 lbs. Colors: red "barber pole" on white.



LO-TEMP PRIMACORD

Jacket of polyvinyl chloride plastic over rayon yarn countering gives this cord exceptional flexibility, with textured surface, slightly tacky. Cord has outstanding handling characteristics at all atmospheric temperatures. It bends easily and knots securely at minus 40°F. Recommended for trunklines and for downlines where abuse is not excessive. Tensile strength 190 lbs. 1000-ft. spool 19.5 lbs. Color: Yellow.



Free Sample Kit

contains dummy samples of five types of Primacord with brief descriptions. When you write for it, tell us about the job.

CONDITIONS	PRIMACORD DETONATING FUSE					
	Plain	Lo-Temp	Rein- forced	Plastic Reinforced	Plastic Wire Countered	
Trunklines	X	х	х			
Small diameter holes – 1½"–2¾"	x		x			
Holes 3" dia. and greater, depending on depth			x	x	x	
Secondary Blasting	X		X			
Deep, ragged holes			X	x	X	
Deep, wet holes				x	x	
When a field shot must stand a long time				x	x	
Loading with heavily rein- forced explosives containers					x	

Primacord is available through your regular explosives supply sources.

THE ENSIGN-BICKFORD COMPANY

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Devoted to the Operating, Technical and Business Problems of the Coal-Mining Industry



APRIL, 1960

IVAN A. GIVEN, EDITOR

Gas Competition

Natural gas moved up to second place in the ranks of energy suppliers in 1958, and in 1959 contributed 26.8% of the total consumption, compared to 18.0% in 1950. Coal (anthracite and bituminous), now in third place, contributed 23.5% in 1959 against 37.8% in 1950. Oil, in first place, gained slightly from 36.0% in 1950 to 39.6% in 1959.

These figures, plus the fact that bituminous was unable to show a gain in the first quarter of 1960, in part because of weather interruptions, again focus attention on the problem of just what will happen in the future. Can gas continue its growth without check, taking business primarily from coal but also oil, or will changing conditions and particularly changing price considerations make a leveling off or possibly even a decline a reasonable likelihood in the relatively near future? Even gas men are beginning to ask that question, though still maintaining that there will be no interruption in progress.

A big reason for gas growth is the fact that it has been grossly underpriced at the well—and still is relative to coal and oil. To compare with coal at \$5 at the mine, gas should sell at 19c per MCM at the wellhead, and to compare with oil at \$3 a barrel (approximately the current value of U. S. output), at 54c per MCM. Even if oil were only \$1 per barrel the equivalent gas price would be 18c. What is it actually? At the moment, around 12c. This little fact is now giving oil the beginnings of some king-sized headaches. Coal has been "enjoying" these headaches for some time.

Can this price line be held? The gas producers certainly are trying to break it. Against them are arrayed the utilities, the consumers, the federal government, state governments in consuming areas and the Supreme Court. This coalition may meet with some success but if so there is real doubt that the gas owners will be willing to sell at giveaway prices. A representative of one major gas producer, for example, flatly feels that wellhead prices must go to 18 to 20c in 3 yr and to 25c in 10 yr—or else no gas. A price of 25c means a rise of 13c per MCM from the present average, or \$3.18 in coal equivalent.

The point of this all-too-brief analysis of the situation is that coal inevitably will be a better and better bargain as time goes on—a situation that is bound to rebound to its benefit, especially if it is successful in burning this message home to general industry, where one of its major opportunities lies. Perhaps coal cannot expect a big boom in the next few years, but at the same time slowness at the moment is no reason for unduly discounting the opportunities that lie ahead.

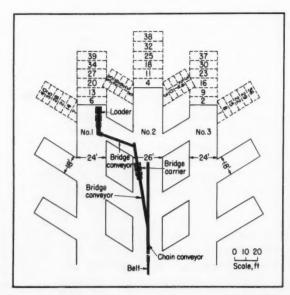


HIGH-CAPACITY LOADER is first link in extensible-conveyor system. Unit gathers coal at the rate of 6 tpm.

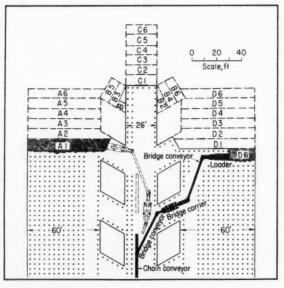


BRIDGE CARRIER is sandwiched between two bridge conveyors. Unit has four-wheel drive, front and rear steering,

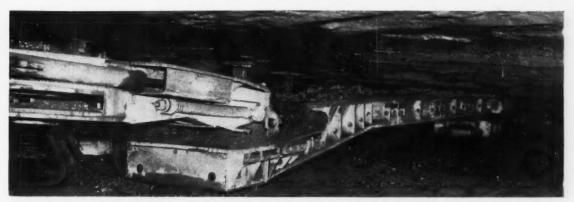
Continuous Transportation in Special



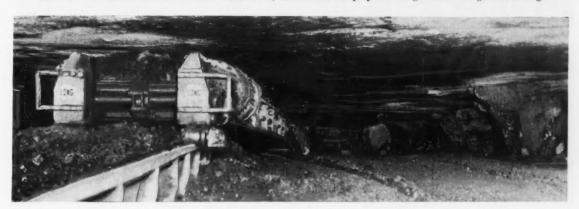
ENTRY CYCLE starts in room neck off No. 3 heading, continues in numbered sequence until 40 cuts are loaded.



ROOM CYCLE is similar to entry cycle. Numbers show sequence of loading 24 cuts from each setup.



BRIDGE CONVEYOR receives coal from loader boom, delivers it to self-propelled bridge carrier. Bridge is 40 ft long.



DISCHARGE POINT of extensible conveyor system is 120-ft chain conveyor that discharges onto 30-in belt conveyor.

Mine Layout Paces High Productivity

Extensible bridge-conveyor system designed for continuous loading enables Cedar Creek to mine up to 68.8 tons per man in 36-in West Virginia seam.

PEAK PRODUCTION of 550 tons per shift in rooms and 483 tons in entry development by 8-man crews in 36-in coal results from successful application of "Full-Dimension" bridge-conveyor mining at the Cedar Creek Mining Co., Otsego, W. Va. Production during the month of October, 1959, averaged 420 tons per shift in rooms and 325 in entries.

Mine management, headed by Victor Hurley, president, points out three reasons why the company is able to maintain this high level of productivity in 36-in coal:

1. Application of high-capacity equipment for continuous loading.

2. A mining system tailored to en-

able equipment to work with a minimum of lost motion.

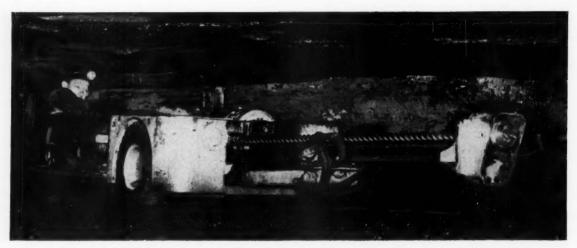
Skilled machine operators who can handle at least two machines equally well.

Cedar Creek mines the Pocahontas No. 3 seam, which has a sandstone roof and shale floor. Although some local rolls are present, the seam dips fairly uniformly at 1½%. The coal is soft and therefore cutting and drilling bits have long life.

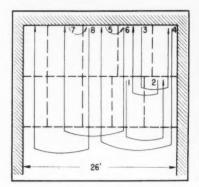
Mining crews work two shifts, 7 am to 3 pm and 5 pm to 1 am. Because of the thin coal and high-capacity loading and conveying equipment, Cedar Creek finds that one cutting crew cannot prepare enough coal on-shift

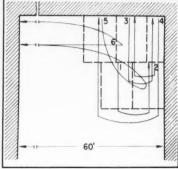
for continuous loading. In some instances the on-shift crew cuts 19 places but this is not enough to keep the loader busy. This situation, and also because of the use of shortwall cutting machines, has presented a preparation bottleneck. To help overcome this problem, the company employs an extra cutting crew to have coal prepared when the production shift begins.

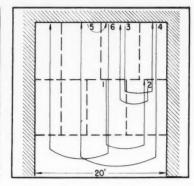
There are actually three preparation shifts and two production shifts employed in the following manner: No. 1 production crew and No. 1 preparation crew works from 7 am to 3 pm. The No. 2 preparation crew works from 3 pm to 11 pm, while the No. 2 production crew works from 5 pm to 1 am. This leaves a 2-hr lapse for preparation. The No. 3 preparation crew relieves No. 2 crew at 11 pm and works until 7 am. They work from 11 pm to 1 am with the produc-



IMPORTANT MACHINE in fast-moving face preparation is this new-type high speed hydraulic coal drill.







LOADING PLANS for working places are designed to keep unproductive machine motions to a minimum.

tion crew and the balance of their shift on preparation, supplying the section, and also fireboss for the oncoming shift.

Face Equipment

Cedar Creek employs Long "Full Dimension" equipment in driving entries and rooms. These units provide a continuous loading and conveying link between the face and the main conveyors. The loading-conveying system includes the following units: 188 loader with swing boom; 40-ft PT-218 Piggyback; MBC-20 Mobile Bridge Carrier; a second 40-ft PT-218 Piggyback; and a 120-ft M-526 chain conveyor which feeds a Long 30-in Lo-Rope belt. The loader, Piggyback and bridge carrier remain linked together while loading each cut of coal and while traveling from place to place. The chain conveyor and belt remain in the same location until a definite sequence of cuts is

completed in all of the working faces.

Face-preparation equipment includes two Goodman 512 cutters with bugdusters and a Long TDF-10 rubber-mounted hydraulic drill. Management notes a considerable saving in face-preparation time since the mobile drill was added. Previously the coal was drilled with a handheld hydraulic unit. Because of the limited seam height and pileup of cuttings, the two holes in the right side of the face previously had to be drilled before cutting could start. The TDF-10 has eliminated this bottleneck since it can drill over the dust. One man operates the drill and also does the shooting.

The 188 loader gathers coal at the rate of 6 tpm and discharges it onto the first 40-ft Piggyback which rides on the Mobile Bridge Carrier. The carrier transfers the coal to a second 40-ft Piggyback which is attached to the carrier and rides on the 120-ft chain conveyor. Traveling 240 fpm in a

6x20-in pan, the chain takes the full discharge from the Piggyback and feeds it to the belt conveyor.

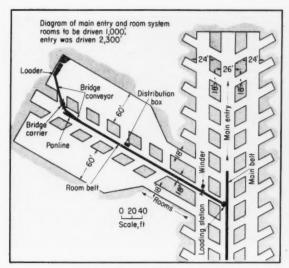
Section Crews

Section crews in entry development and room work include the following men:

Loader operator 1	
Loader helper 1	
Bridge-carrier operator 1	
Cutters	,
Driller	
Mechanic 1	
Foreman	
Sub total 8	
Extra cutting crew (one	
charged each shift) 1	
Total 9	1

Entry Development

Cedar Creek opened the mine with three headings on 50-ft centers and



TYPICAL MINING PLAN designed for loader-bridge-conveyor mining includes three-heading entry with angled rooms.



RECEIVING COAL from chain conveyor, belt conveyor is last link in conveyor system. Unit travels 500 fpm.

drove them 2,300 ft to the property line. Breakthroughs were angled 60 deg with the headings and cut every 50 ft from the middle heading. Rooms were necked 48 ft deep off both sides at 60 deg and in line with breakthroughs as the three headings advanced.

The belt and chain conveyor remained in the middle heading, which was driven 26 ft wide, and were advanced after each breakthrough was cut. Outside headings were driven 24 ft wide and breakthroughs 18 ft.

The Entry Cycle

The "Full Dimension" train of equipment, which was used in driving the entry and now is in room work, provides a mobile continuous loading and conveying system between the face and the chain conveyor that feeds the belt. To take full advantage of the equipment's capacity, Cedar Creek adheres to a planned loading cycle in both entry and room work. The entry cycle is as follows:

Loading starts in the first cut of a room neck off the No. 3, or right, heading and then moves in the following sequence: No. 3 heading; breakthrough from No. 2 to No. 3; No. 2 heading; breakthrough from No. 2 to No. 1; No. 1 heading; and first cut in room neck off No. 1 heading. This sequence continues uninterrupted for five complete cycles at which time the breakthroughs are completed. The final cycle includes

taking a cut from each heading and room neck.

The described sequence yields 40 cuts of coal, which are loaded from one setup of the loader-conveyor system. As soon as this sequence of 40 cuts is completed the face crew extends the belt and moves the chain conveyor 50 ft to the next breakthrough. This move takes only 30 min.

The chain conveyor length remains constant at 120 ft, and it is moved intact as the belt is extended 50 ft. There are no pan-ups. The chain conveyor is self-tramming and incorporates the tail section of the belt conveyor. Since pan-ups and moves associated with conveyors in the past are eliminated, management says the system overcomes the big objections to conveyor mining.

Sections of belt are stored in spools in 100-ft lengths near a Long Hy-Winder, which is installed astride the belt conveyor. Spools are designed so that a special adapter can be fitted through a hollow shaft and attached to a Long Inspector's Friend for easy handling between the storage point and the Hy-Winder.

After the spool is rolled into position at the Hy-Winder, it is picked up by a hydraulic lift on the winder. Pick-up clamps on the lift's boom are roller mounted so the spool can be easily positioned over the belt for unspooling. A hydraulic motor rewinds the rubber on a spool when the belt is shortened.

Rope Side-Frame Belts

Coal flows from the section to a steel storage bin at the portal over two 30-in Long Lo-Rope belt conveyors. One unit is installed in the middle heading of the entry and the other works as part of the "Full-Dimension" system in rooms. Both belts have pneumatic takeups that maintain the proper belt tension. These takeups receive compressed air from a small service-station-type compressor located near the belt drive.

Both conveyors have 27-deg troughing idlers on 6-ft centers and carry coal at 500 fpm. Return idlers are on 12-ft centers. A 40-hp 440-V AC motor powers the tandem-drive entry belt, and a 30-hp motor runs the single-pulley room-belt drive. Both conveyors have self-cleaning tail pulleys.

The Room Cycle

Rooms with a depth of 1,000 ft are driven on retreat in sets of three off both sides of the entry. The mining sequence is similar to that in entry work, as follows:

Loading begins in the left, or No. 1, room and continues in the following sequence: breakthrough from No. 2 to No. 1£ No. 2 room; breakthrough from No. 2 to No. 3; and No. 3 room. This sequence continues for three complete cycles, at which time breakthroughs are completed. The crew then takes three additional cuts from the face of each room before extend-

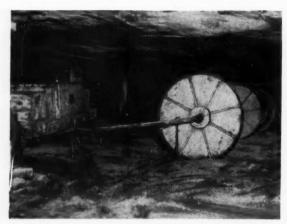


PERSONNEL CARRIER doubles as supply tractor, tows three loaded trailers to face. Unit is battery powered.



PARKED near face in each place, loaded trailers store assorted materials within easy reach of face crew.

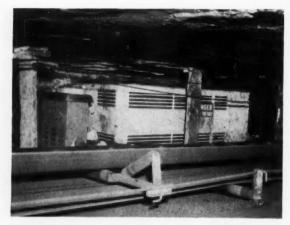
Special Equipment, Designed for Use in Thin Coal, Simplifies Supplying, Belt Handling



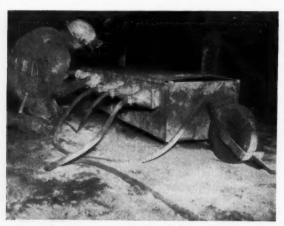
SPECIAL attachment enables personnel carrier to roll belt spools from storage area to the hydraulic belt winder.



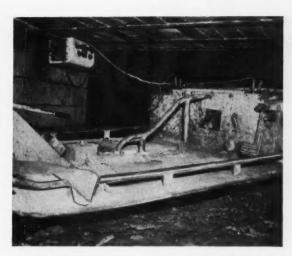
POWER WINDER speeds adding or removing 100-ft sections of belt. Hydraulic jack lifts roll of belt into position.



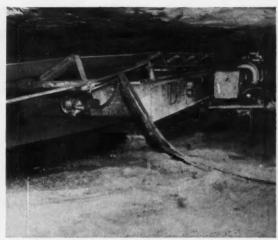
COMPACT transformer beside belt conveyor reduces voltage from 4,160 to 440 for operating AC face equipment.



EASILY MOVED section power distribution box has main breaker and individual breakers for each machine.



PORTABLE CHARGERS at portal (above) and at face make possible recharging of batteries when carriers are not in use.



PNEUMATIC TAKEUP maintains constant tension of conveyor belt. Small shop-type compressor provides air for takeup.

ing the belt and moving the chain conveyor ahead 50 ft in the middle room. The face crew makes this extension in the same manner as in entry work and as soon as the mining sequence is completed. This room sequence yields 24 cuts of coal per belt extension.

The mining system employed at Cedar Creek in rooms is particularly interesting and may have special significance, particularly in thin-seam mining. Three rooms are driven; the middle room is 26 ft wide and is protected by pillars 20 ft wide. The outer rooms are driven 60 ft wide, but without the roof exposure normally associated with wide rooms. Loading in the two outside rooms approaches longwall mining. The loader actually loads the coal at right angles to the face and virtually parallel with the cut. This results in minimum maneuvering and improved loadability. As a result, loading is accomplished at a very fast rate, making possible greater output per manshift.

Permanent timbering, posts on 4-ft centers, can be carried to within 10 ft of the face. It is not necessary to preserve a loader runway outby the last open breakthrough. This system is particularly adaptable to effective roof control without the use of roof bolts, although it has been pointed out by mine management that if roof bolting were used, it would probably be confined to the center, or 26-ft room.

The 60-ft rooms can be cut and loaded at a higher rate than the narrower places mined in entry development. This is the major reason for the increased tonnage produced in rooms.

Crew Duties

To help crews perform more effectively, Cedar Creek assigns each man specific duties. For example, the loader operator follows a definite sequence of maneuvers while loading a cut of coal. These maneuvers vary with the width of the face. While the loader operator maneuvers his helper sets safety timbers at the face and all permanent timbers along the right side of the place. The helper also keeps the right side of the place free of loose, fine coal and rockdusts to within 20 ft of the face.

The mobile-bridge-carrier operator is responsible for keeping trailing cables out of the path of equipment. He also coordinates his moves with the loader for the easiest possible loading and transportation of coal.

Each cutter operator is responsible for maintaining the proper width of place. His helper assists him as needed and sets safety timbers while a place is cut. He also cleans up any fine coal along the left side of the place and rockdusts to within 20 ft of the face. The drill operator is responsible for proper placing of holes as well as loading and shooting.

Although the crew members have definite work assignments, each is skilled in two or more jobs. For example, two men can operate the drill, four can run the loader, three are skilled cutters and four are competent bridgecarrier operators. And the mechanic can operate any machine. By

training the face men in several jobs the company is assured a smoothly running crew in the event a key operator is absent.

Supplying the Mine

Each working place receives its supplies in a rubber-mounted trailer towed by a Long 125A battery-powered Inspector's Friend utility car. The Inspector's Friend tows three or four of the loaded trailers into the mine and then leaves one in each place. Each trailer carries a mixture of bags of rockdust, timbers, headers and wedges. And it is not uncommon for one trailer to carry 40 bags of rockdust. Although it is powered only by a 1½-hp motor, the Inspector's Friend is able to tow several tons of materials.

Six 6-V Gould heavy-duty batteries, designed for traction applications, provide power for the unit's 36-V motor. Cedar Creek gets 12 to 15 mi of service per battery charge but usually relies on short automatic charges to maintain the proper charge. For example, automatic chargers are installed at the mine portal and in the face area so batteries may be charged any time the Inspector's Friends are not in service. The last operator is responsible for setting the proper charging rate. He does this by measuring the specific gravity of the batteries and then noting on a chart the proper setting for charging at this gravity. Once the charger is set it requires no further attention.

(Concluded on next page)



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Maintaining the Equipment

Section mechanics, employed on both production shifts, are responsible for minor repairs and daily inspection of all machines. Each mechanic starts his shift by lubricating all points exposed to dust. He also lubricates these same points later in the shift. Another important duty of the section mechanic is daily inspection of all motor bearings and speed reducers. Reducers are drained, flushed and refilled every 60 to 90 days.

Throughout each shift the section mechanic observes the various machines in operation and notes any points that need attention. He then reports any maintenance needs to the master mechanic who takes immediate steps to correct the trouble. Systematic inspection and prompt attention to maintenance needs keep equipment in top operating condition at Cedar Creek.

Powering the Equipment

Power is delivered to the mine substation at the portal at 4,160 V. This outside unit has an oil circuit breaker and ground-trip protection. Three No. 1 conductors with separate insulation and mounted on a messenger wire carry power 1,000 ft to skid-mounted Westinghouse dry-type 300-kva transformer that reduces voltage to 440. This unit is equipped with distribution breakers. The three conductors and messenger are suspended from the mine roof. The messenger wire serves as a solid neutral plus a groundtrip circuit.

Power, leaving the station at 440 V, is carried by 500,000-cir mil cable to a Long rubber-mounted section distribution box equipped with a main breaker and individual breakers for each piece of equipment. It has a ground-trip device which is adjusted so any contact between ground and any phase producing a current of 2 or more amps open the main breaker at the main transformer. This system protects personnel against shock and equipment against fires.

The section distribution box has a control circuit which will provide protection in event of failure of one of the belt conveyors. This device will automatically break the circuits to all face equipment and thus prevent pileup at the belt. Centrifugal switches at each belt head control this circuit.



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LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

ORSANCO Resolution 5-60

"WHEREAS: By resolution adopted on the 6th day of April, 1955, the Ohio River Valley Water Sanitation Commission promulgated a statement of policy and procedures for the control of industrialwaste discharges into waters included within its jurisdiction by the terms and provisions of the Ohio River Valley Water Sanitation Compact; and

"WHEREAS: Waters of the Ohio River Valley Water Sanitation District are being polluted by acid discharges from coal mining and related operations, hereinafter referred to as 'acid mine-drainage,' contrary to the language and intent of the Ohio River Valley Water Sanitation Compact; and

"WHEREAS: it has been demonstrated that the conscientious application of certain principles and practices will, under certain conditions, alleviate the

pollution from acid mine-drainage;

"NOW, THEREFORE: In furtherance of the policy and procedures as above set forth and for the general purpose of contributing to the achievement of the objectives specified in Article I of the Ohio River Valley Water Sanitation Compact;

"BE IT RESOLVED: That the following measures are hereby adopted by the Commission for the control of acid mine-drainage pollution in the Ohio River Valley Water Sanitation District and pursuant to the statement of policy and procedures are to be followed by the signatory states:

"1 (a)—Surface waters and ground waters shall be diverted where practicable to prevent the entry or reduce the flow of water into and through workings;

(b)—Water that does gain entry to the workings shall be handled in a manner which will minimize the formation and discharge of acid mine-drainage

to streams.

"2. Refuse from the mining and processing of coal shall be handled and disposed of in a manner which will minimize discharge of acid mine-drainage therefrom to streams.

"3. Discharge of acid mine-drainage to streams shall be regulated insofar as practicable to equalize the flow of daily accumulations throughout a 24-hr

period.

"4. Upon discontinuance of operations of any mine all practicable mine-closing measures, consistent with safety requirements, shall be employed to minimize the formation and discharge of acid mine-drainage.

"5. Under appropriate circumstances, consideration shall be given to the treatment of acid minedrainage by chemical or other means in order to

mitigate its pollutional properties.

"Nothing stated in this control measure shall be construed to relieve any municipality, corporation, person or other entity from responsibility for compliance with existing federal, state and local laws and regulations."

Acid-Drainage Curbs Are Here

ORSANCO and coal compromise long-standing differences on initial acid-drainage controls. Present practices are reviewed. An action program is proposed. Still ahead: Final solutions; extending curbs to other types of discharges.

By W. A. Raleigh Jr. Associate Editor, Coal Age

ACID-DRAINAGE CONTROLS were predicted in a COAL AGE feature, June, 1958. They arrived in "Resolution No. 5-60" adopted Jan. 14, 1960, by the Ohio River Valley Water Sanitation Commission. ORSANCO is an interstate agency dedicated by Congress-approved compact to control stream pollution in eight states of the Ohio River Valley—Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia and West Virginia.

The resolution (above), initially reported in this magazine's February issue (p 28), culminates over 2 yr of intensive study by ORSANCO's Engineering Committee and its Coal Industry Advisory Committee, whose members represent companies mining most of the Nation's bituminous coal. Focus of the study has been to draft controls mutually acceptable to ORSANCO and CIAC.

On the one hand, ORSANCO has campaigned long and hard to get bituminous to recognize formally its responsibility to curb acid drainage.

On the other hand, CIAC has bat-

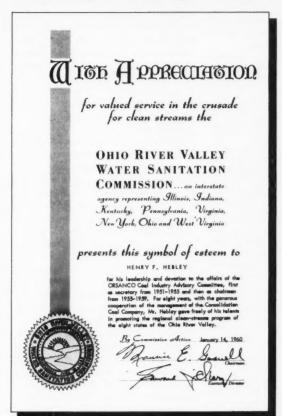
tled equally long and hard to protect the industry from punitive regulations before satisfactory, well-defined solutions to the problem are available.

Thanks largely to the dedicated efforts of Henry F. Hebley, former chairman of, and now consultant to, CIAC, a mutually acceptable compromise was achieved. Amendments incorporated in the compromise were built around this basic concept: Under certain conditions, it is possible to alleviate acid drainage in both underground and strip mining.

In gaining this degree of compromise, states E. J. Cleary, ORSANCO executive director and chief engineer, "We see a major breakthrough in philosophy." While control measures have advanced technically and practically, he explains, the coal industry has been "enveloped in a spirit of defeatism."

Through CIAC, bituminous has

To Henry F. Hebley, These Tributes for Dedicated Effort . . .



WHEREAS, Mr. Henry F. Hebley, has been associated with the Coal Advisory Committee to ORSANCO from its very inception in the year 1951, and

WHEREAS, Mr. Hebley has served the Committee first in the capacity of secretary-treasurer, and later as its chairman, and

WHEREAS, Mr. Hebley has taken a leading part on numerous state and national committees on matters of stream pollution, and

WHEREAS, Mr. Hebley has served the Committee with distinction for a number of years on matters pertaining to coal research and related subjects.

NOW, THEREFORE, BE IT RESOLVED, that the members of the Coal Advisory Committee and their associates, desire to commend him for the sound basic principles which he has supported for a constructive approach for the coal industry, on problems pertaining to stream pollution, and

BE IT FURTHER RESOLVED, That the members of the Coal Advisory Committee wish to express their deep sense of appreciation to him for his sincerity of purpose, his integrity and his unquestioned fairness in dealing with all problems of the industry in which he was engaged, and

BE IT FURTHER RESOLVED, That the members of the Coal Advisory Committee now unanimously express their most sincere desire for his continued efforts on behalf of this Committee.

COMMITTEE ON RESOLUTIONS Mr. J. J. Foster

Mr. J. J. Foster Mr. T. E. Johnson

From ORSANCO

From the Coal Industry

pledged full cooperation in supporting and carrying out the measures. In exclusive interview with Coal Age following their adoption, the Committee (p 83) noted that the measures are not out of consonance with those now practiced by many mining companies—water removal is an integral and continuing part of good mining practice. Exceptions to the rule—the recalcitrant companies—have stood out and contributed greatly to the charge that the entire industry has been "dragging its feet."

CIAC stresses that the control measures will not in themselves solve the acid-drainage problem. From 60 to 90% [most agree on about 75%] of acid pollution comes from abandoned mines and the responsibility here has not yet been defined.

"We would also like to make it clear that we are open to considering any sound, reasonable research project which gives promise of contributing to final solutions of the acid-drainage problem." The industry has been frequently criticized for its small expenditure on stream-pollution research. The criticism is usually based on the Mellon Institute program, under S. A. Braley, where expenditures have been running about \$40,000 annually.

"Most of our critics," CIAC points out, "fail to realize that this expenditure is primarily for laboratory research. Many times this amount is spent on field projects which seek to apply the results of lab research to actual mining operations. Other undetermined amounts have been, are, and will be spent through company, university and government research programs which do not isolate or specifically designate acid-drainage research costs."

Tough Job Ahead

Neither CIAC nor ORSANCO is under any illusions about the future of controlling stream pollution from coal mining and related operations. Ahead are the tough tasks of implementing and enforcing Resolution 5-60, developing new and improved acid-control techniques, defining responsibility for acid drainage from abandoned mines, and extending ORSANCO authority to other types of discharges. Broad lines of a comprehensive action program are proposed by Coal Age (p 82). Meanwhile the ball has already started to roll on enforcement of Resolution 5-60.

In West Virginia last November, ORSANCO Sanitary Engineer F. W. Montanari held the commission's first "curbstone clinic" on techniques and legal aspects of acid-drainage control. In attendance were water-pollution

Action Program

TO EXPAND AND INTENSIFY the industry's stream-pollution-control program, Coal Age offers the following keys to effective action:

In strip mining—Seek licensing systems that would deny new permits to "fly-by-night" operators whose past records show they have evaded control measures now practiced virtually across-the-board (Pennsylvania already has such a system and it has been eminently successful).

In underground mining—Broaden efforts to assess known and experimental acid-control techniques for possible applications.

In preparation—Accept treatment and disposal of wastes from plant effluents as an antegral part of the processing cycle.

In handling gob piles—Take more care in fitting accepted practices to local conditions and explore new methods.

In abandoned mines—Work continuously with enforcement bodies to fix pollution-control responsibility.

In new properties—Survey existing waste drainage before starting operations and file reports with pollution-control officials.

In state inspection services—Campaign for higher pay scales that will attract engineers qualified to evaluate mine-drainage situations.

In public relations—Undertake to educate enforcement officials and the general public (1) on the facts about acid mine-drainage, and (2) on what coal is doing to accept its share of responsibility for control.

In research—(1) Prepare an operator's reference classifying mines and geologic conditions in terms of possible acid-abatement procedures, and (2) set up a coordinated program to expedite completion of present studies and field experiments.

control officials from Pennsylvania, Indiana, Ohio, Kentucky, Illinois, West Virginia and the U. S. Public Health Service. Another clinic is planned this spring.

To further aid enforcement officials, as well as individual coal companies, a reference manual on recommended principles and practices is under study by ORSANCO and CIAC. Technical talent for evaluating and monitoring discharges will be made available through association engineering staffs, government agencies, etc.

Resolution 5-60 will in itself boost the cause of enforcement, ORSANCO officials point out. Most state water-pollution control authorities have concentrated on policing the discharge of solids-effluents from preparation plants. Now, for the first time, the eight member-states of the compact have a common basis for fulfilling their obligations to control acid pollution. Illinois, for one state, has already notified all coal mines that its Water Sanitary Board expects them to comply with the ORSANCO resolution.

In the final analysis, success of the new regulations will hinge on how seriously individual coal companies, including the "recalcitrants," pursue their implementation. Self-interest theoretically should rule out further dilatory tactics. An impartial observer, close to all facets of the aciddrainage problem for many years sums up the situation, in substance, as follows:

- The acid-drainage controls finally passed by ORSANCO are reasonable and practical. In fact, a considerable number of operators already conform to such measures as good mining practice.
- They incorporate the thinking and work of all those who have been leading the effort to achieve controls which are fair and just and which do not put either the operators or ORSANCO in untenable positions. Earlier proposals could have done just that. Court actions probably would have resulted. And, with punitive decisions, both sides would have lost all previous gains.
- If coal operators do not fully accept and comply with the present regulations, they will undoubtedly be followed by stiffer, probably punitive ones.
- It must be remembered that ORSANCO is on the "hot seat." Taxpayers have spent hundreds of millions of dollars on municipal sewage and disposal plants all over the Ohio Valley; nearly all industries have spent equally large amounts to control their waste discharges; and pollution-control authorities are continually plagued by vacationers and fishing enthusiasts who will not accept degradation of their favorite recreational haunts.

• The regulations should satisfy all pressure groups that ORSANCO has done something about stream pollution by the coal industry. At the same time, they should benefit the coal industry by getting more operators to do what is good mining practice in the first place.

Acid-Drainage Control: Present Practice

Preventive measures for controlling acid drainage boil down to four main lines of action: keep water out, keep drainage moving, segregate sulphuritic materials, and neutralize acids in preparation-plant effluent and in "casual" standing pools.

It would be presumptuous to attempt to analyze and document possible applications of these basic concepts to all geologic and mining areas. This is a huge job in itself better reserved for the industry's research agenda. In the case of the individual mine, possible applications might be pursued better by a chemical engineer or pollution-control specialist.

In order, however, is some broad picture of the present status of acid-drainage knowledge and practice. This picture has been provided in a memorandum prepared by Ernst P. Hall, member, CIAC, and Henry F. Hebley, consultant to CIAC. Excerpts from their memorandum follow:

Sources and Formation—Acid waters from coal mining are derived principally from five sources; abandoned mines, protective pumping, active underground mines, refuse dumps or gob piles, and strip mines.

It has been conclusively shown that iron sulphide in the form of pyrite or marcasite is the primary origin of sulphuric acid from coal. These minerals are oxidized by atmospheric oxygen (with or without an assist from bacterial oxidation) to produce sulphuric acid. This acid is picked up by percolating waters and carried out of the mine.

Other minerals associated with or near the coal may be dissolved in these percolating waters causing some or even all of the acid to be neutralized before leaving the mine area. Worth noting: All mine drainage waters are not acid and the acidity at each drainage point may vary greatly because of the peculiar geologic and hydrologic conditions involved.

If the natural cycle of oxidation and transport is broken at any point, the problem of stream pollution by acid mine water would cease to exist. But this oversimplified statement of fundamentals is complicated almost beyond imagination with this result: Satisfactory solutions have not been found except in a few situations.

Abandoned Mines — Various estimates have placed the acid discharge from these mines at 60 to 90% of the total acid discharged from all coal mines. This results from the cumulative effect of continued acid production after all coal is extracted.

Mine-sealing programs have been extensively tried to mitigate this drainage problem. Other ideas such as contact antioxidants have also been tested. But none of these schemes have proven successful or even shown real promise of being successful except in isolated cases. Tests show that the oxygen content inside many sealed mines is only slightly lower than before sealing. The apparent reason: Sealed mines have a fractured and porous cover which permits enough oxygen supply for continued acid formation.

Flooding an abandoned mine completely, thus sealing off oxygen from the sulphide minerals, seems to be quite successful in preventing acid formation and, thus, stream-acid pollution. The procedure, however, is limited by both legal and physical restrictions. Physically, for example, a large percentage of mines are above the water level and cannot, therefore, be held full of water.

[At the AIME meeting, N. Y. C., February, 1960, J. Richard Lucas, Ohio State University, reported that a field testing program at McDaniels mine, southeastern Ohio, has demonstrated the feasibility of reducing acid formation in a drift mine by air sealing and flooding (Coal Age, March, 1960, p 126.]

Protective Pumping — It is frequently necessary to pump drainage water from abandoned workings to prevent flooding of an adjacent, active underground mine. Additionally, some mining regulations require that water pressure be relieved from headers to protect active mining areas. These restrictions prevent acid control by flooding and demand that the acid-laden water inside the worked-outmine area be pumped away.

Coal Industry Advisory Committee

Members of the Coal Industry Advisory Committee to ORSANCO are:

L. E. Sawyer, Mid-Vest Coal Producers' Inst., Terre Haute, Ind.

Ernest Agee, Indiana Coal Association, Terre Haute, Ind.

H. C. McCollum, Peabody Coal Co., St. Louis, Mo.

L. S. Weber, Mid-West Coal Producers' Inst., Springfield, Ill.
John Crowl, Kentucky Reclamation As-

sociation, Earlington, Ky.

T. J. Hoffman, West Kentucky Coal Co.,
Madisonville, Ky.

Virgil Picklesimer, South East Coal Co., Seco, Ky.

James Hyslop, Hanna Coal Co., Cadiz, O. Larry Cook, Ohio Reclamation Association, Columbus, O.

William Foster, U. S. Steel Corp., Pittsburgh, Pa. W. H. Jukkola, Jones & Laughlin Steel Corp. Pittsburgh, Pa.

Stephen Krickovic, Eastern Gas & Fuel Associates, Pittsburgh, Pa.

Ernst P. Hall, Consolidation Coal Co., Pittsburgh, Pa.

 R. T. Laing, Central Pennsylvania Coal Producers' Association, Altoona, Pa.
 H. A. Sutter, Western Pennsylvania Coal

Operators' Association, Pittsburgh, Pa. J. N. Geyer, Imperial Coal Corp., Johnstown, Pa.

I. J. Richardson, Harman Mining Corp., Harman, Va

J. J. Foster, Island Creek Coal Co., Huntington, W. Va.

Truman E. Johnson, Northern West Virginia Coal Association, Fairmont. W. Va

J. J. Ardigo, Operators' Association of Williamson Field, Williamson, W. Va. Henry F. Hebley, consultant, Pittsburgh Pa.

Recent unpublished data, compiled by the Mine Acid Control Fellowship at Mellon Institute, indicates that continuous pumping of these abandoned areas with maximum water removal may, in some cases, materially reduce the acid load from the area.

Continuous discharge of acid mine water has the added advantage of eliminating "slugging" of the waterway into which it is pumped. This provides the maximum opportunity for neutralization and assimilation of the acid load by the watercourse into which it is discharged. Similar protection against "slugging" could be available if regulations and terrain permitted storage of the acid waters for release during high-water flows.

Active Underground Mines—Water is cleared from most underground mines by a combination of natural drainage and pumps which convey it into a large central sump. From here the water is pumped occasionally (as required) through a borehole to the surface for discharge into a nearby stream. Both the underground drainage-pump system and intermittent pumping from a central sump afford maximum opportunity for acid forgetting.

Recently, unpublished experimental work has been in progress to find a solution to this situation through modified methods of water handling within the mine. One such experiment has been in progress under the direction of the Mellon Institute for over 3 yr and is continuing (Coal Age, March,

1957, p 68). Results to date are encouraging. However, it may require 5 yr or more to develop reasonably good technical data for estimating its final outcome.

An extension of this experiment to other mining operations could require a considerable change in operating technique calling for the elimination of underground sumps and transport of underground water through pipe or lined flumes. Also needed will be more pumping capacity and operational control. Certainly these measures are not to be taken until experimental work has proven its value.

The stream-polluting effects of acid mine-drainage could be mitigated somewhat by the use of demand storage reservoirs (above ground). Acid waters pumped during low river flow could be stored temporarily in the reservoir and released at periods of high flow to minimize the effect on aquatic life and also to permit maximum use of dilution as a disposal method. This system is practiced in certain areas where space and topography favor construction of large lakes and where state regulatory measures allow such progressive measures.

Refuse Dumps or Gob Piles—Much of the pyrite and marcasite associated with coal is removed from the mine as refuse or separated from the coal during cleaning and, along with rock and clays, is moved to a disposal area. These refuse materials may constitute as much as 30% of the material taken from a mine and have a sulphuric-

acid-producing potential quite high in relation to the volume. The process which cleans the coal in effect enriches the potential. It is also heightened by this fact. The acid-producing area of a gob pile includes not only exterior surface acreage but also much larger amounts of interior acreage.

Acid from refuse piles may be leached out by water and carried into the streams in four principal ways: (1) flooding; (2) surface runoff; (3) natural drainage through the piles; and (4) use of the refuse pile as a filter for coal washery sludge. The first two methods are occasional in nature but provide ample opportunity for building up large acid concentrations on exposed refuse surfaces. When transported to streams, this acid reaches its highest concentration rapidly and causes great harm to aquatic life cycles. The third and fourth leaching methods provide a more continuous, though not necessarily uniform, flow of acid.

Control of acid water from gob piles does not present the extremely complex problems associated with underground acid drainage. As this is a man-made problem, it can be successfully mitigated by proper disposal practices. For proper disposal, refuse should be:

1. Sized to eliminate large particles (2-in minus makes an excellent size but some larger materials can be tolerated if evenly distributed).

2. Dumped in a pile site carefully selected to eliminate underground water flow through the refuse pile.

3. Compacted thoroughly to minimize airflow in the pile.

 Covered with an adequate vegetated-soil cover, constructed to divert surface water from the pile and to minimize or eliminate cover erosion.

In one novel approach to refuse disposal, refuse is crushed to a fine size and pumped to a large sludge pond along with other washery sludge. This pond is large and deep enough to provide for a reasonably long life even when receiving such a large volume of material. The pond also permits good clarification of the effluent liquor. Refuse so disposed does not continue to oxidize as it is inundated and effluent water is free from both acid and suspended solids.

The rather radical approach of underground stowage of refuse should not be altogether neglected as a possibility. Even though mining regulations, economics, and the mechanics of underground stowage are large stumbling blocks, they are being overcome in other countries and, at some future time, may become more attractive here.

Strip Mines – The greatest strides toward stream-pollution abatement have been made in the strip mining of coal. Several states have legislation dealing with this phase of pollution. However, Ohio and Pennsylvania are probably the most notable for their achievements.

The principles of "clean stream" stripping were developed before legislation was enacted. In general, these principles are:

1. Eliminate water wherever posible in the strip cut through surface water diversion and stream relocation.

2. Segregate and cover (in the strip pit) coal measures not recoverable as coal.

3. Reseal the exposed face of the coal through proper backfilling and water impoundment, or both.

These measures have proven adequate and are enumerated in the mining regulations of both Pennsylvania and Ohio.

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Euclid's modern crawlers—the 211 net h.p. Model C-6 and the Twin-Power Model TC-12 with 425 total net h.p.—have set new standards of tractor production in mine and quarry work. With performance proved Torqmatic Drive, both of these crawlers have excellent maneuverability and fast response that cut's work cycle time. They're engineered for easy service accessibility that results in less downtime and lost production.

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The 50 Biggest Bituminous Mines

Ranked by 1959 Tonnage

	COMPANY	NAME OF MINE	STATE	DIST.	1959	PRODUCTION 1958	1950
1	Peabody Coal Co	Peabody No. 10	III.	10	3,764,146	2,902,215	New 1952
	United States Steel Corp		Pa.	2	3,461,579	3,500,311	3,137,832
	Clinchfield Coal Corp		Va.	8	3,196,358	341,563	New 1958
	Freeman Coal Mining Co		III.	10	3,111,124	3,032,634	New 1950
	Clinchfield Coal Corp		Va.	8	2,714,106	2,402,806	1,333,520
6.	Hanna Coal Co. Div. of Consolida-						
	tion Coal Co	Georgetown (S)	Ohio	4	2,648,900	2,624,107	2,247,989
7.	Eastern Gas & Fuel Associates	Kopperston 1 & 2	W. Va.	8	2,416,520	2,361,651	1,463,827
	Peabody Coal Co		Ky. W.	9	2,399,157	2,167,866	New 1957
9.	Central Ohio Coal Co	Muskingum (C) (S)	Ohio	4	2,355,855	1,952,608	New 1952
	Mathies Coal Co		Pa.	2	2,192,214	1,901,583	886,811
	Peabody Coal Co		Ky. W.	9	2,163,867	2,063,322	672,357 (
	Old Ben Coal Corp.		I11.	10	2,025,470	1,981,918	1,337,249
13.	Pocahontas Fuel Div. of Consolida-		*** **			1 800 001	
	tion Coal Co		W. Va.	7	1,819,182	1,769,831	103,543
	Peabody Coal Co		Ky. W.	9	1,748,039	1,078,443	589,608 (2
	Clinchfield Coal Corp		Va.	8	1,738,676	1,429,109	New 1956
	Peabody Coal Co	River King (5)	I11.	10	1,721,710	1,694,315	New 1957
1/.	Semet-Solvay Div. Allied Chemical Corp.	Harawood (C)	W. Va.	8	1 605 010	1 250 156	1 451 571
10	Eastern Gas & Fuel Assoc		W. Va.	3	1,695,018	1,358,156	1,451,571
	Olga Coal Co		W. Va.	7	1,689,080	1,708,748 1,426,800	1,613,906
	Powhatan Mining Div. North	Oiga	W. Va.	,	1,040,000	1,420,800	960,115
20.	American Coal Corp	Powhatan No. 1	Ohio	4	1,626,206	1,433,678	1,045,568
21	Freeman Coal Mining Co		Ill.	10	1,625,192	1,578,624	New 1951
	Amherst Coal Co		W. Va.	8	1,598,622	1,460,011	766,326
	Duquesne Light Co		Pa.	2	1,583,695	1,642,823	1,044,823
	Mountaineer Coal Co. Div. Con-	Wai wick (C)	A ct.	~	1,303,093	1,042,323	1,044,623
	solidation Coal Co	Consol No. 9	W. Va.	3	1,578,473	1,568,410	746,316 (3
25.	Gibraltar Coal Corp		Ky. W.	9	1,573,761	1,626,376	New 1955
	Alabama Power Co		Ala.	13	1,511,600	1,407,822	492,502
	Truax-Traer Coal Co		I11.	10	1,510,596	1,400,350	1,158,367
28.	Nashville Coal Co., Inc	Uniontown (S)	Ky. W.	9	1,501,727	1,065,764	New 1953 (4
	Hanna Coal Co., Div. Consolida-				-1111	1.001.01	21011 2500 (
	tion Coal Co	Bradford (S)	Ohio	4	1,499,762	1,089,130	1,128,994
30.	Christopher Coal Co. Div. Con-						
	solidation Coal Co	Osage No. 3	W. Va.	3	1,465,996	1,186,521	877,807
	Jones & Laughlin Steel Corp		Pa.	2	1,446,947	2,196,668	1,804,556
32.	Peabody Coal Co	Sunnyhill No. 8 (S)	Ohio	4	1,442,586	1,204,570	875,482 (5
33.	Island Creek Coal Co	Island Creek No. 27	W. Va.	8	1,405,050	1,052,173	361,542
	Enos Coal Mining Co	Enos (S)	Ind.	11	1,403,955	1,432,788	1,224,190
35.	Christopher Coal Div. Consolida-						
	tion Coal Co		W. Va.	3	1,398,570	1,493,516	New 1956
36.	Truax-Traer Coal Co		***				
		2 (S)	III.	1C	1,395,932	576,144	New 1951
	United States Steel Corp	Gary No. 2 (C)	W. Va.	8	1,388,555	1,395,333	1,352,970
38.	Powhatan Div., North American	D 1 . W 0	01:		4 40		
20	Coal Corp		Ohio	4	1,379,483	1,319,308	1,021,197
	Jones & Laughlin Steel Corp	Shannopin No. 2 (C)	Pa.	2	1,335,201	1,787,650	835,860
40.	Pittsburg & Midway Coal Mining	D1: (C)	17 117	0	1 224 440	1 004 005	** ****
4.1	Co		Ky. W.	9	1,331,440	1,004,296	New 1953 (6
	West Kentucky Coal Co	East Diamond	Ky. W.	9	1,314,681	1,195,390	1,254,077
†Z.	Christopher Coal Co. Div. Con-	Aslamaiaht Ma 1	W. Va.	2	1 212 712	1 001 000	000 111
10	solidation Coal Co		Ky. E.	3	1,313,713	1,221,278	908,111
	Inland Steel Co			8	1,309,918	1,613,550	1,223,251
	Youghiogheny & Ohio Coal Co	Neims	Ohio	4	1,283,908	1,216,284	784,994
13.	Pocahontas Fuel Co. Div. Con- solidation Coal Co	Dishon	W. Va.	7	1,274,672	1 017 740	4 005 055
16						1,317,743	1,305,056
	United Electric Coal Co's Freeman Coal Mining Co		III.	10 10	1,273,765 1,269,773	1,151,729	1,130,386
	Bethlehem Mines Corp		W. Va.	3		1,189,907	New 1952
	Eastern Gas & Fuel Assoc		W. Va.	7	1,258,224	1,415,169	1,526,110
	Snow Hill Coal Corp.		Ind.	11	1,249,737 1,231,200	1,224,397	925,700
					1,401,200	1,313,872	765,279
	TOTAL PRODUCTION, 50 MI				88,290,541	79,479,260	39,397,677
	U. S. TOTAL PRODUCTION, I	Bituminous and Lignit	e		410,000,000 (a) 410,446,000	516,311,000

SYMBOLS: (C) Captive Mines. (S) Strip Mines. (a) Preliminary. (1) Ken Coal Co. (2) Terteling Bros., Inc. (3) Jamison Coal & Coke Co. (4) Stony Point Coal Co. (5) Sunnyhill Coal Co. (6) Paradise Collieries, Inc. (Source: Key stone Coal Buyers Manual, A Coal Age Affiliate.)

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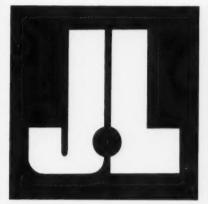




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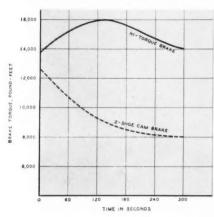
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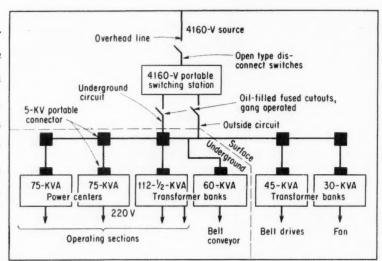
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Otis G. Stewart

Executive Engineer-Mining, Union Carbide Metals Co., Div. of Union Carbide Corp., Alloy Works, Alloy, W. Va.

THE USE OF AC for underground coal mining has increased in the past 20 yr to the extent that today many new operations plan to use this type of power exclusively. In view of the almost universal use of DC in years past it is only natural that in consider-

ing AC we compare each item involved with its DC counterpart. For the sake of brevity, however, this article will include such comparisons only as necessary or desirable to explain the points of superiority of one over the other.

During the past decade economic necessity and other factors have dictated many changes in coal-mining methods. Methods which were considered proved and which were once almost universally accepted have been made obsolete by the introduction of new equipment and new practices. The introduction of regulatory measures, such as the Federal Mine Safety Code, has directed the attention of mine management to the importance of:

- 1. Increased safety.
- 2. Increased economy.
- 3. Greater reliability.

Safety

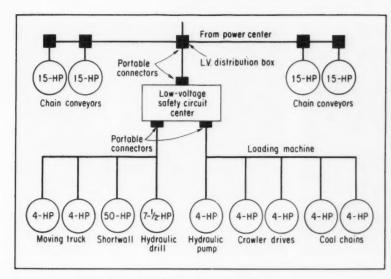
In our opinion safety is one of the most important considerations with



PORTABLE SWITCHING STATION includes cutouts and lightning arresters.



TYPE SH-D CABLE carrying 4,160 V underground is suspended from the timbers with insulated J-hooks. Voltage was raised from 2,300 in the late 40s.



section circuit (right) serving loading machine and auxiliary units.

Evaluation and Selection

any mining system. Underground coal mining is by its very nature beset with many hazardous conditions, and it would be a grave mistake to add manmade hazards. An AC power distribution system properly engineered, installed and maintained contributes to safety by eliminating some of the hazards imposed by the nature of a DC system. These contributions to safer operation include:

- 1. A very appreciable reduction in exposure of personnel to shock hazards by the elimination of the exposed overhead trolley wire; the fact that the magnitude of fault current is appreciably reduced; and by the rapid clearing of any fault that might impose a hazardous potential on the frames of equipment.
- 2. An appreciable reduction in the possibility of gas ignition by face equipment due to the reduction and, in many cases, the complete elimination of arcing faults.
- Minimization of the hazard of gas ignition by face equipment by the elimination of the resistors, commutators and brushes associated with DC motors, and by the reduced complexity of AC controllers.
- 4. Major reduction in the hazards attendant upon the use of trailing ca-

bles by the rapid fault clearing made possible by the very sensitive protection that can be provided for the AC system.

Economy

- 1. By the nature of their design most AC machines are less costly to build than their DC counterparts. Cost of a standard 10-hp 220-V AC motor is approximately one-third that of a comparable 250-V DC motor, and the same ratio holds for the starters. While this ratio may vary considerably over the entire range of sizes and types, AC equipment will invariably be appreciably lower in cost than the equivalent DC equipment.
- 2. The cost of an underground power center for AC mining is likewise approximately one-third that of an equivalent DC conversion unit.
- 3. Since power is transmitted to the underground load center at comparatively high voltage with the AC system, the correspondingly smaller currents permit an appreciable reduction in the size and cost of conductors.
- The ease with which AC can be controlled, compared to DC, results in more economical and troublefree equipment.

- In most cases AC protective circuitry applied with the proper circuit breakers will provide better protection than can be obtained, even at higher cost, in a DC system.
- 6. AC motors are far less costly to maintain than DC. This is shown by the following comparison of repair costs for a DC traction motor and a similar AC motor. (J. H. Sherrerd Jr. and Andrew Rusnak, Johnstown Coal & Coke Co., Mining Congress Journal, January, 1959):

DC Motor	
Armature rewound	\$ 82.00
Commutator	118.00
Set main fields	62.30
Set commutating fields	48.80
Set brush holders	21.10
Set brush-holder studs	8.35
Set brushes	3.04
Total	\$343.59

AC Motor	
Stator rewound	
Total	

Thus an AC motor may be completely reconditioned for about 31% of the cost of a similar DC motor.

Reliability

- 1. The electric power or distribution transformer, because of its simplicity, ruggedness and the absence of moving parts, is inherently a reliable and troublefree piece of equipment. It requires a minimum of inspection or supervision, very little maintenance, and is capable of carrying moderate overloads for an appreciable length of time with a relatively small loss of useful life. On the other hand, all types of DC conversion equipment are relatively complex, many have moving parts, and they are quite limited in overload capacity. They require close supervision, rigid and frequent inspection and frequent maintenance.
- 2. The squirrel-cage induction motor with its one moving part is the simplest device known for producing rotary mechanical power. Power is applied to one stationary winding. The rotor winding consists of bars which





112½-KVA SKID-MOUNTED askerel-filled 4,160/2,300/440/220-V transformer bank (left) and 75-kva nitrogen-filled 4,160/2,300/440/220-V center for lower coal (right). Both include high-voltage connectors and low-voltage circuit breakers.

are either brazed to terminating rings at the ends of the rotor or cast integrally with these rings.

In contrast to the beautifully simple induction motor, the DC motor has two or more sets of stationary field coils, a revolving armature with a complex winding which terminates on a commutator built up of hundreds of pieces of copper and insulation, and carbon brushes with their associated brushholders, springs and shunts through which the current is conducted to the armature. Because of its simplicity, the AC induction motor, properly applied, will give a maximum of troublefree service with very little maintenance.

3. Portable high- and low-voltage switching equipment and safety circuit centers, a feature of the AC system, provide a maximum of reliable protection both to the operating personnel and to the apparatus.

It is believed that the foregoing adequately justifies the selection of AC underground power systems. The problem now becomes one of selecting the proper equipment to suit the conditions and the assumptions involved in the design of an underground system.

Before proceeding, a complete and thorough study should be made of the mining laws of the state in which the mine is to be located. Such study may reveal limitations that may restrict the application of and in some cases rule out completely some of the most desirable features provided by the AC

system. Federal and state laws were, in most cases, based on installations of DC systems and until these laws are modified to accept the concepts of modern AC systems and equipment, any AC designs must be adapted to conform to the applicable sections of the existing regulations.

System Design

Assuming that the foregoing justified the selection of AC as a power source, we may now proceed with development of a design for an underground system. However, at this point it will be necessary to consider other factors first:

- 1. Nature and location of coal seam to be mined.
- 2. Market or end use of the coal produced.
- 3. Method and cost of transporting coal to the point of usage.
- Equipment and manpower available for the proposed mining operations.

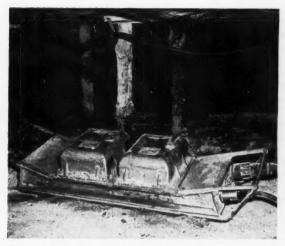
We shall now proceed to consider a mining system that was actually designed in the middle 1930s, installed in the very early 1940s, modified in the late 1940s and modernized in the early 1950s. Prior to the initial AC installation in the 1940s, this mine had been in operation for some 20 or more years as a hand-loading operation. It was located in the No. 2

Gas, or Campbell's Creek, seam in south central West Virginia. Initially, 250-V DC was used for the underground power. An extensive, well designed underground track haulage system was already in place and an aerial tramway had been installed to deliver coal to a power plant about 1¼ airline miles from the mine.

The coal seam averaged about 40 in in thickness. A thick band of shale in the seam served as the mine roof, though it was not a satisfactory roof material because of its friable nature. The seam dipped to the northwest and this put nearly all mainline haulage on a rather heavy grade. The mining area was located between two large worked out and abandoned mines, one to the east and another to the west. Also, a large faulted, or want, area running in a northeast direction bisected the available coal reserve. Because of tender top conditions extensive, heavy timbering was required.

Electric power was supplied at 2,300 V from the steam-electric station which it served and was transmitted to the mine over an overhead three-conductor transmission line. Underground 250-V DC power was supplied by three widely dispersed motor-generator sets and was transmitted conventionally using bare trolley and feeder lines for the positive and bonded track for the return.

Because of the heavy grades and wide dispersal of DC substations, haulage demands on the power system were severe. Outages due to overloads were frequent and line losses were excessive. To have maintained





FACE UNITS for control and safety include low-voltage distribution box (left) with head cable coming in and polarized service cables going out. At the right is a face safety control center with room conveyor in foreground.

uninterrupted face operations with mechanical equipment would have required, at great expense, a complete redesign of the DC system. A careful analysis indicated the wisdom of retaining the existing DC system for electric locomotive haulage and to provide power to a few scattered outlying areas where the then current mining methods of hand loading of mine cars would be retained. This would permit retention of some of our older employees whom we felt could not readily adapt themselves to the complete mechanical-mining system we hoped to achieve.

The life of this mine was estimated at 15 yr. It was known at that time that a limited amount of mineable coal of questionable quality existed in a seam lying very high in the hill above the seam being mined. This coal could be mined and blended with the higher quality coal and the end product would be acceptable.

If mining operations were to be extended, the workings would be in a more remote area which would necessitate truck or rail haulage or a combination of both. Conditions in this final operational area would be somewhat similar to those of the above-mentioned upper seam.

From the beginning it was apparent that any design would have to be extremely flexible and adaptable to modification and improvement. Portability was a must, and ease and economy of movement were prime considerations of design. Because of the pioneering and development nature of this design, it was reasonable to as-

sume that some changes might be necessary following operating experience. This has proved to be true.

Transition Stage

The first logical step in design was the transition from hand loading into mine cars to hand loading onto face conveyors. From the face area, room conveyors delivered the coal at the room mouth onto a mother conveyor which fed to mine cars by means of an elevating conveyor. Coal was cut by shortwall machines and drilled by hand-held electric drills. A small portable rockdust distributor was supplied to each operating section. Depending upon conditions, two or three faces comprised an operating section.

Three-phase 60-cycle electric current was transmitted underground through 3-conductor 5,000-V Type SH-D rubber-covered cables of appropriate size. Initial runs of cable that would be more or less permanent were conventionally spliced and were installed on the bottoms of aircourses. For protection 3x3-in timbers were laid end to end on alternate sides of the cable with cross ties of 2x10-in boards at overlapping ends of the timbers.

The outby, or source, end of each semipermanent run of cable was terminated in a 5,000-V portable 3-conductor polarized connector. In this manner, once it is properly attached to the portable connector, the high-voltage line is polarized and will thereafter assure proper phase sequence and equipment rotation.

Where cables crossed beneath mine tracks or travelways they were buried in conduit at least 1½ ft deep. Additional pieces of high-voltage cables in 500-ft lengths, properly equipped with portable connectors, were made up and used to extend or retract the mains.

High-voltage cables were attached by portable connectors to a skidmounted, 1121/2-kva bank of three single-phase Pyranol-filled 2,400/-440/220-V transformers. A gang-operated rack of three underground-type oil-filled fuse cutouts, skid-mounted and separate from the transformer bank, was inserted ahead of the bank as protection for the transformers. Subsequent experience proved that even the small amount of oil contained in these cutouts created a hazard. Since adequate electrical protection was provided in the high-voltage switching station at the mine portal, these cutouts were not needed.

The low-voltage switching equipment on the secondary side of the transformer bank consisted of a manually-operated trip-free quick-break air circuit breaker. Secondary power circuits were attached to this breaker by means of portable low-voltage connectors. These connectors were polarized throughout the entire underground system so that, once properly made up with their cables, they could not be improperly applied.

Secondary cables were fabricated in unitized lengths in multiples of 100 ft. A limited number of 50-ft lengths was provided to facilitate cable extension or retraction. The low-voltage feeder cables were supported by racktype gang-mounted insulators suspended from mine timbers along an aircourse or heading. They terminated in specially designed junction boxes equipped with polarized plugs and receptacles and provided for throughand/or branch circuit application.

Low-voltage branch circuits were similar in all respects to feeder circuits except as to size and termination. Since branch circuits supplied power directly to the face area they terminated in safety circuit centers equipped with polarized connectors and smaller-sized trip-free air circuit breakers for overload protection. Each safety circuit center is also equipped with a ground-fault protective device.

Delta Operation-Practice at this mine throughout its entire evolution has been to operate with a delta-connected 3-phase 440/220-V secondary. It has been standard practice not to interconnect high- and low-voltage ground circuits inside the mine. The high-voltage ground conductors are contained within the interstices of the high-voltage cable and are earthed only outside of the mine. The lowvoltage ground circuit is a bare copper or equivalent conductor connected to a low-resistance ground outside the mine as well as to adequate ground rods at available locations inside the mine, and in turn attached to the frame of each piece of low-voltage switching equipment. In this manner we believe that men and equipment in the face area are not exposed to the possible hazard of a high-voltage ground fault being impressed upon the frame of equipment they are handling.

One of the advantages of using a delta-connected secondary is that it permits one phase going to ground at or on any single piece of equipment without interrupting operations and without any undue hazard to personnel so long as each such piece of equipment has an adequately maintained frame ground. If a second phase should go to ground, then shortcircuit conditions are set up and protective circuitry will function. In the instance of a secondary with a grounded neutral a ground fault on any phase sets up short-circuit conditions and protective equipment removes the section on which the fault occurs from the line; all operations on the section must be stopped until the fault is removed or corrected.

Fault Detection-It has been our experience that most ground faults occur in the face area. With this system we find that we may readily detect the existence of a phase-to-ground fault by the use of three lights of proper voltage connected in "Y" across the three phase wires and the neutral of the bank of lights grounded. If a ground fault occurs the light on the faulted phase is shorted out and ceases to glow. A greater voltage is impressed across the other two lights and they glow at a higher intensity. The operator may disconnect pieces of equipment until the third light again glows. The fault may then be corrected without disturbing other equipment.

Operating equipment is connected to the safety circuit center by 4-conductor rubber-covered cables. Three are phase conductors and the fourth is a ground conductor. These cables have 4-conductor portable connectors which are likewise polarized when fabricated so that they cannot be incorrectly connected.

These multiple-conductor couplers have two extra plugs and sockets which serve a pilot circuit between load and line. These pilot plugs are in series with the control circuit of the main breaker in the safety circuit center. If the pilot circuit is open the main breaker is open. If an attempt is made to disconnect the head cable of a machine without first removing the machine from the line this pilot circuit will open the main breaker before the load conductors are opened and thereby prevent damage or hazard to equipment or personnel.

Second Phase

The success of this first breakthrough into partial mechanical mining naturally led to the second phase. In this phase the shortwall cutting machine was mounted on a tractortype truck so that it could move from place to place. A mechanical loader was installed to load the coal onto the room conveyor. The mother and elevating conveyors were eliminated and coal was loaded directly into the mine car. This was now possible because of sequence operations in the face area. Coal was loaded in only one place at a time and the boom attendant moved from place to place as loading changed. There were no other major changes.

As a result of increased power demand it soon became apparent that line voltage was inadequate. After careful study a 1,250-kva 3-phase auto transformer was installed at the power station and primary line voltage was raised from 2,300 to 4,160 V. All transformers at the mine were changed from delta to wye-connected primary; the secondary remained 440/220 delta. All triple and outside secondary circuits were 440 V but all underground secondary circuits were 220.

This change in the primary voltage required a change in the protective circuitry, which was readily made. These changes proved to have been well conceived when, at a later date, it became necessary to operate with purchased power. Our circuits then met power-company requirements.

As the coal reserve in the original seam was depleted it became necessary to supplement mining operations by opening the previously mentioned upper seam. This being an all-new operation with anticipated short life it was planned to eliminate inside track haulage entirely. Thirty-inch rubber belt conveyors were installed for main and secondary haulage. Chain conveyors were continued for gathering haulage.

The belt conveyors delivered the coal into dropbottom mine cars at the portal, and electric haulage moved these cars to and over a hillside bin where they were automatically dumped. From this bin a vibrating feeder and 30-in belt conveyor delivered the coal to a 30-in inclined circular tube through which the coal was fed by gravity down the mountain to a blending bin. Here it was thoroughly mixed with coal from the lower seam.

Feed control was interlocked with the dumping system at the lower level and under normal operations the coal was blended in a fixed proportion. There were, however, occasions when coals did not come from both seams in even proportions, and on such occasions the tipple boss could cut out one or the other system to operate separately. Since there was a large surge bin at the loading terminal of the aerial tramway short periods of single tipple operation did not materially affect the end product.

Seam height averaged somewhat less than that in the No. 2 gas mine. Because of low head room, a changeover was made from standard post

and collar timber sets to slab headers supported by roof bolts. The original Pyranol-filled transformer, because of its height, could not be used underground. Newly developed portable 3-phase nitrogen-filled dry-type transformers equipped with both low- and high-voltage connectors of the type in use at our mine were installed. A 220-V 3-phase roof-bolt drill was added and another step in the evolution of a mechanical mining system had been accomplished. At this point it is significant to observe that this mine had no DC underground. DC track haulage was used from the portal to the tipple.

During the operation of these two mines our captive plant supplied electric power, and operation at relatively low power factor did not impose any financial penalty. The only means available to improve system power factor was over-excited operation of the synchronous motors on the m-g sets. Since power factor did not have to be considered many machines were somewhat over-motored. This resulted in a relatively low system power factor. Eighty-five percent lagging was accepted as reasonable system power-factor performance.

Final Development

In early 1957, when operations commenced at a third location from our power plant and in the No. 5 Block, the final phase of the development of this mining system was effected. One difference was the substitution of truck haulage from a storage pile near the mine portal for the electric locomotive haulage. This storage pile has an underground conduit containing a 30-in belt conveyor which is used to load trucks.

At peak, the coal pile is an upright cone. When drawn down it becomes a truncated cone with an empty inverted cone from the top of the truncated section to the point of discharge onto the conveyor line. In this manner the coal pile serves as a surge bin with about 500 tons live capacity and about 1,000 tons dead storage. At the end of its life a bull-dozer will push this 1,000 tons onto the feeder and conveyor and the entire capacity will have been utilized. This has proved to be an economical and satisfactory method of operation.

This new operation is entirely AC except for small rubber-tired battery

tractors for transporting material and personnel. The coal lies rather high in the hills and at no place is it greater than 2,000 ft from one outcrop to the opposite side of the mountain. At complete or maximum development there will be 6,000 ft of main and secondary belt conveyors in use.

It is thought that an area containing about 600,000 tons will be assigned to a portal. Two or three portals will be fed into one marshalling area. Each portal will be designated as an independent mine but will be connected to the adjoining mine by means of access headings with ventilation air locks. In this manner mine fires or other mishaps may be readily controlled or contained with minimum effect on adjacent working area and overall operational functions.

Ordinary untreated timbers will last for the limited life of each mine and therefore expensive treated timbers will not be required. Escapeways may be easily and quickly provided and ventilation will be less costly and more efficient.

One major change has been the substitution of hand-held hydraulic coal drills for electric hand-held units. This change was made to eliminate the hazard of electric shock.

During early operation at this new location we learned that we would be compelled to improve our power factor or pay a penalty on power purchased. We installed suitable capacitors at our high-voltage switching station and, for several months, our power factor varied between 99% and unity. Recently, however, things have slipped and our last power-factor reading was 92% lagging. We believe that this is the result of having 40-hp induction motors on belt conveyors that have been shortened on retreat. We are now in the process of replacing these motors with smaller

If this fails to improve the power factor we will make a power system study and install low-voltage capacitors which may be switched with the offending equipment. Capacitors presently installed at the switching station have caused light-load voltage elevation to the extent that we do not feel safe in adding any additional unswitched capacitance.

Evolution continues in the design of mechanized mining equipment. Within the past 2 or 3 yr AC shuttle

cars have become available. We contemplate the future replacement of the chain conveyors with rubbertired gathering trucks and the replacement of the shortwalls presently mounted on tractor trucks with machines mounted on rubber tires. These units will be employed to develop main and panel headings. We contemplate replacing cutting machines and loaders on production or extraction sections with continuous miners. Such a change, if it comes, will be accomplished in the same orderly and unhurried fashion that accompanied previous changes. The operational performance must be established and proved safe and the economics must be sound before such change will be made.

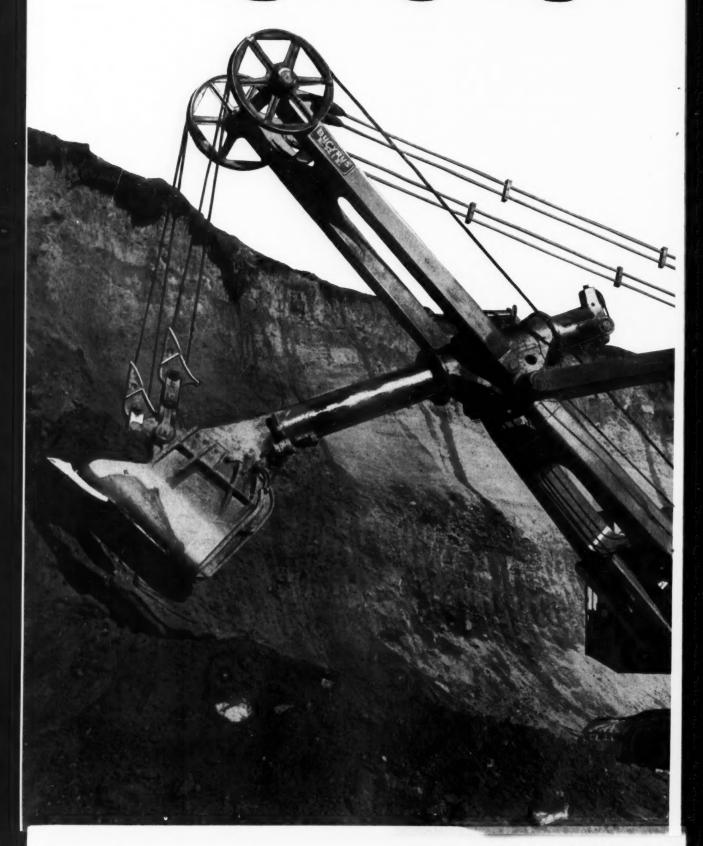
We have no qualms or misgivings as to the use of AC to power these new-type machines. We anticipate the need to raise face voltage from 220 to 440 V because of larger and more concentrated load demands. All equipment purchased in the past is, and all future purchases will be, dual voltage. Our cable sizes are adequate and control and switching equipment will need only minor alterations.

We would be remiss if we did not call attention to certain basic requirements for successful use of AC in underground mining. We consider two of the most important to be:

- 1. Good voltage regulation. If AC motors are to operate efficiently and maintain normal life expectancy, voltage regulation must be kept within comparatively narrow limits. Failure to do so will result in overcurrent, overheating and reduced torque—even to the extent of stalling.
- 2. Prevention of single-phase opertion. This can be satisfactorily accomplished by the proper application of comparatively inexpensive phase-unbalance relays and/or the use of thermal overcurrent relays in each of the three phases of motor starters. Single-phase operation may be encountered frequently on power systems on which distribution circuits are protected only by fuses.

In concluding, the writer wishes to acknowledge valuable assistance in the preparation of this article by E. M. Hansford, electrical engineer, Alloy Works, and J. L. Knight, assistant superintendent, Bell Creek mine, both of the Union Carbide Metals Co.

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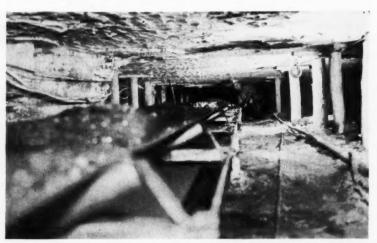
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diesels in same size bracket! speed reduced - you move on through the dig-GET THE FACTS on this new modern electric control you'll find only in Bucyrus-Erie electric excavators. ging cycle! Write Bucyrus-Erie Company, South Milwaukee, Wis. most respected name in the field! . . .



NO SPILLAGE is evident on this 2,500-ft conveyor which operates at a speed of 500 fpm. Carrying idlers are on 6-ft centers and return idlers 12 ft.



EXTENSIBLE CONVEYOR with PVC belt operates at distances up to 3,000 ft.

Unit above is on 2,100 ft center. Thirty-horsepower motor is not overloaded.



PVC Woven

UP TO A FEW YEARS AGO there was little choice in selecting the type of material and construction of conveyor belting. It was not possible to produce a radically different type of belt that would provide necessary safety features and at the same time stand up under conditions expected of it in coal mining. Today the picture has changed. There is an entirely new concept in belt manufacturing that combines the newest synthetic fibers and plastics with a solid interlockingweave construction which eliminates ply separation, rot and mildew. The new materials and construction also make the belts fireproof, impervious to oil, moisture, and highly resistant to wear and tear.

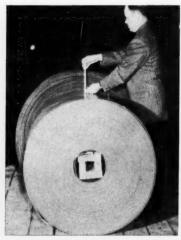
Industry Acceptance

Since the introduction of the woven PVC belt, a number of old ideas regarding thickness, appearance and cover have been revised. Materials now being used have entirely different characteristics. Method of construction is a departure from conventional practices. Therefore, the general concepts which apply to conventional belting do not necessarily apply to the new type.

Thickness — Conventional belt strength is determined by the number



ICING CONDITIONS have no effect on belt or belt operation. PVC belts work satisfactorily at temperatures ranging from -10 to 212 F.



DIAMETER of a 300-ft 36-in roll of PVC belting is 8 in less than rubber.

Nylon Belts

of plys, whereas PVC belts are of a single solid weave construction. The thinner PVC belt is equal in strength to a 5 or 6-ply conventional belt, as an example. Belt strength cannot be determined by thickness alone. Method of construction and material are the governing factors.

Cover—Again material and construction are important. On conventional belting the cover is important for two reasons: (1) it protects the ply carcass from physical damage and wear—the carrying side has a thicker cover—and (2) it seals the carcass against moisture which causes mildew and rot.

Plastic and nylon have certain characteristics which do not require as much or additional cover protection. These materials are stronger and are resistant to moisture, mineral oil, etc. Consequently, the impregnated cover on the woven belt, contrary to years of accepted practice, need not be as thick. Both sides have equal cover thickness and either can be used as the carrying side. If the plastic cover is torn or worn the nylon carcass, of an interlocking-weave construction, is not seriously affected by wear, impact, moisture or oil.

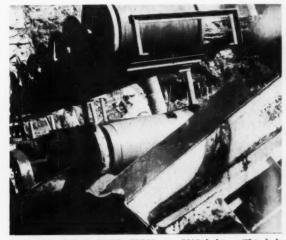
Appearance—There is considerable difference in the appearance of con-



PVC BELT used on raw-coal conveyor in preparation plant. Reports indicate that belt is gaining wide acceptance for this application.



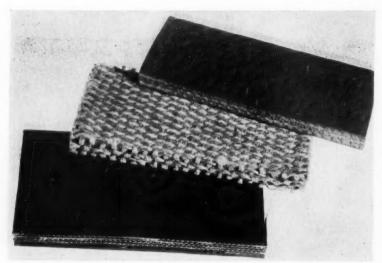
PVC BELT used on loading booms where coal is oil-treated. Deterioration does not occur since materials are impervious to water and oils.



PUNCH MINING OPERATION uses PVC belting. This belt is expected to outlast conventional belts by two to one.



SPLICES went through drive pulleys as belt turned over. Results: slight damage to splices, none to belt.



PVC BELT (top) is impregnated with polyvinyl chloride. Center sample shows how nylon and yarn are combined. Conventional belt is shown at bottom.

How One PVC Belt Is Made

To form the carcass or tension member, three types of high-strength nylon yarns are interwoven between a cotton pile or filler yarn to support the PVC only. One of the nylon yarns is especially designed to resist tearing, thus making tear characteristics approximately four times greater than ply belts. The yarns are woven with a special integral selvage which prevents separation.

The solid-woven carcass is impregnated with polyvinyl chloride (PVC) plastic. The nylon yarn is supported on all sides by plastic which forms a cushion to resist impact and acts as a sealer, leaving no voids or spaces within the belt. Each carrying member of the belt is nylon.

Two types of woven PVC belts are marketed under the trade name of Ruslon by West Virginia Belt Sales. One is for permanent or rigid-conveyor units and the other for extensible conveyors.

Belt Data

Thickness 11/32 in and ¼ in
Widths 24 to 42 in
Tensile strength warp (minimum) per inch of width 2,100 to 2,500 lb
Tensile strength filling (minimum) per inch of width 900 lb
Weight (nominal) 1.94 lb per sq ft
Minimum recommended pulley diameter 8 in
Recommended operating speed, fpm 150 to 500
Recommended angle of incline (dry coal) 19 deg
Surface coefficient of friction 0.63
Working tension per inch of width 200 lb
Working temperature recommended (deg F)
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ventional and PVC belting. Conventional-belt surfaces and edges are smooth and uniform while the other is not. There is no benefit in having smooth edges and covers on PVC belting since material and construction are entirely different from conventional belting. This belting, at first glance, does not look as if it would withstand rough treatment. If judged on appearance alone it probably would not be accepted. The real test, however, is in the performance and opera-

tion. The following is a report on experience with one make of PVC belt at several mines in West Virginia.

Field Experience

Although this new belt, made in the U.S. by the Russell Mfg. Co., Middletown, Conn., and nationally distributed by the West Virginia Belt Sales Co., Mt. Hope, W. Va., has been in service for a relatively short time in this country, sufficient information has been obtained to evaluate performance even though actual life cannot be determined as yet. However, all indications are that it will be as serviceable or more so than conventional belting.

One sizeable Boone County Mine has used PVC belting for several years. At present 12,000 ft is in service. The conclusion is that it has greatly improved the performance of the mine conveyor system. Until PVC belts were installed downtime on conveyors was a serious factor. The general superintendent reports that "Downtime is no longer a problem. We have not purchased anything but woven PVC belting for the past several years. Furthermore, as far as I am concerned we do not intend to buy anything but PVC belting."

The most desirable feature of the belt is seen as the single inter-locking-weave construction using nylon fibers. This particular weave not only increases belt strength but also eliminates ply separation and greatly reduces, tearing, slitting and other mechanical damage.

Due to the type of mining at this operation it is necessary at times to extend belts more than 2,000 ft. When using conventional belting in lengths greater than 2,000 ft (4,000 ft total) splices would break or pull out. From experience this has not happened when woven PVC belts are extended beyond the 2,000-ft limit.

On one occasion the PVC belt fouled in the head pulleys due to a piece of draw rock. Instead of the belt breaking, the drive and motor were pulled off the head frame. The belt was not damaged. In another fouled-belt incident the fireproof PVC belt was melted in two by the drive pulley, and was completely free of any flame, fire, or toxic fume hazard.

Other features which have proven advantageous are:

- 1. Belt does not mildew.
- 2. It is resistant to longitudinal ripping and puncturing.
 - 3. Training ability is excellent.
- Stretch is not excessive (amount of stretch that does occur is not detrimental).

Although the belts cannot be repaired, none have been taken out of

COMPARE

LW Adams* advantages with any other grader

...you'll be convinced they give you more for your money!

Blade controls operate through threejaw clutches that mate without shock or kick-back, Joint-free construction of power box eliminates oil leakage on cab floor.

> Short, stocky lift arms give rigid support to blade assembly. Sturdy, telescopic links, with enclosed ball and socket connections, have shim adjustments for wear,

Best way to judge a grader is to compare it... against any machine in its class. Do this with LeTourneau-Westinghouse graders; you'll find they give you more money-saving, more work-boosting features than any other grader on the market. Others may offer some of these advantages, but you get all of them in high-speed L W graders.

Check the features illustrated here, then take the next step... ask us to show you an LW grader in the size you need. The 85, 115, 123, and 160 hp graders have 15 speed transmission (including 3 optional creepers) with speeds to 26 mph. 145 and 190-hp POWER-Flow® models have torque converter, speeds to 27.4 mph. Choice of GM or Cummins rubbermounted engine. A phone call or a short note is all it takes to arrange for a demonstration!

Strong T-shaped drawbar gives firm circle support... for accurate blading in all positions.

With power steering, operator exerts only slight pressure on steering wheel, and hydraulic power does the work. Yet, "road feel" is retained. Power-steering system has its own hydraulic pump, for high efficiency.

100% anti-friction bearings in drive train from engine to wheels reduce friction, heating, wear...cut downtime and repair cost.

Full-floating drive-axle . . . axles carry NO weight . . . take far less stress and strain. Result: less breakage, less repair cost and downtime, plus more efficient power transfer.

Front-to-rear frame member is 1piece, heavy steel U-channels welded continuously, end-to-end, into box structure. Frame provides a rugged, stable blade-mount... steady and rigid for life.

Heavy-duty circle is precision machined for smooth "chatter-free" operation. The big 63"-diameter circle assures accurate control of cut. Replaceable circle teeth are protected from abrasive materials. Crank-type lateral shift is free from lost motion and vibration common to open-rack type.

Gear-driven leaning-wheel mechanism is enclosed to give protection against dirt. Wheels hold set position...require no safety lock-pin for high-travel-speeds, or when using front-end attachments. You have up to 28" front-axle clearance, depending on tire size. This prevents axle from bulldaxing high windrows, lets grader come up out of deep ditch-cuts without front-axle dragging the shoulders.

*Trademark G-2106-G-1



LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

service or replaced. Consequently, belt repairs have been eliminated. This is a saving in itself, not only in repair cost, but also labor.

Woven PVC belts have proven so successful underground that plans are now underway to use them in the preparation plant where conditions permit application.

The chief engineer of another coal concern echoed, in many respects, the findings of the Boone County operation. One observation was that the lighter-weight PVC belt permitted extending conveyors from 1,800 ft to as much as 2,500 ft without overloading motors. He also noted that the coefficient of friction of Ruslon was greater, thus reducing belt slippage and jumping.

This company is now using PVC belting in a number of their preparation plants. Rubber belts for certain applications would normally last approximately 18 mo. PVC belts are now doing the job and have been in service for longer periods without signs of appreciable wear. The belt-

ing is being used on raw-coal conveyors and on loading booms where coal is oil treated. Oil has not affected the belt in any way. By using PVC belting in preparation plants the company gains on insurance rates.

One company whose operations are not as extensive as the preceding has been using belt conveyors since November 2, 1959. This new installation started with Ruslon belts. A total of 1,350 ft had been placed in service by January 11, 1960. Some 5,000 ft will be in operation by April. The superintendent reports that the belt has performed satisfactorily from the first day it was installed. He expressed satisfaction with the belt's excellent training ability and carrying capacity with return and carrying idlers spaced at 12 and 6 ft intervals, respectively.

Still another company on an experimental basis reports that the PVC belt is performing very well. The general foreman lists the following advantages:

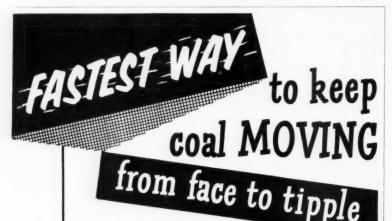
- 1. Coefficient of friction is better than rubber.
- 2. Belt is easier to handle in low coal.
 - 3. Installation time is less.
 - 4. Splices hold better.
- Belt does not break down at splices.

In summing up he said: "The new belt seems to be quite an improvement over others. I believe it will take more wear and tear than conventional belting. It has carried 96,000 tons of coal at a speed of 480 fpm and there are no signs of wear."

One company with a unique operation supplements its large stripping operation with punch mining. Thirty and thirty-six inch belt conveyors are used to carry coal away from continuous miners to outside loading stations. The mine foreman noted that: "Punch mining is extremely rough on belts. Conventional belts would last us about 6 mo. We have used Ruslon belt for 7 mo. and at this time cannot notice any appreciable wear. We will more than double the life of our belts."

Conveyors at this mine are operated at a speed of 500 fpm. Cold weather does not affect belt performance or the belt. Carrying idlers are spaced 6 ft apart and return idlers 12 ft.

Coming in May . . . the story of O'Donnell No. 2, Rochester & Pittsburgh Coal Co.'s modern mine, producing Fairmont coal near Gilmer, W. Va.



You can avoid costly loading-point bottle-necks by using STAMLER Car Spotters.

STAMLERS will move your coal FASTER . . . MORE EFFICIENTLY . . . and AT LESS COST than ANY OTHER METHOD! This is proven by the production records of STAMLER users.

In YOUR mine STAMLERS will pay for themselves in a surprisingly short time. Maintenance cost is so low as to be practically negligible. The first STAMLER ever built is still in active use.

STAMLER
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CAR SPOTTERS

STAMLER has 50% MORE car spotters in use than any other make! There must be a reason. Ask for details.

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Are rising costs for pit clean-up and maintenance cutting your profit margin?

With today's bigger pits and more widely-scattered operations, neglect of maintenance and clean-up can cut deeply into your profits. For example, it will increase haul costs... add impurities... and create an untidy pit that slows operations and invites accidents.

If you increase the number of your slow-moving clean-up tools, you add materially to operating costs. But there is an answer that will permit you to have a planned clean-up and maintenance program and also keep operating costs low. That is to put speed and mobility in this part of your operation. Here's a clean-up tool we think you should investigate — the high-speed LeTourneau-Westinghouse Tournatractor®.

This rubber-tired tractor can: (a) replace 2 or 3 crawler-tractors now handling pit-floor clean-up around your scattered shovels; (b) handle haul-road maintenance, construction and drainage problems to help your haulers travel at safe, profitable speeds; (c) help open up new areas of operation, build rail-beds, spot rail-cars, tow equipment; (d) clean-

up around plant area, dress and seal stockpiles; and, (e) handle miscellaneous tractor assignments anywhere on your property quickly and at low cost. Here are the facts that back these important claims:

"Go-anywhere" mobility

Speedy Tournatractor is never more than a few minutes away from its next assignment anywhere in your pit or plant area. This tractor always takes the shortest route — via rocky pit-floor, benches, down "shot" banks, over hard-surfaced roads, or cross-country. Unit's big, low-pressure tires do not damage air-drill hose lines, RR tracks, pavements. With rubber-tired tractors there are no delays or expense for flatbed loading and haul, even to a new work location many miles away.

Completes job faster

Tournatractor's 17 mph forward speed is more than twice that of comparative crawlers. Instant shift and high reverse speeds to 7.2 mph are important, too—since nearly 50% of your working cycle on doz-

quickly cleans pit-floor around shove. Rubber-lived tractor's high working and traveling speeds permit it to get around to scattered shovels more times per day . . . also to keep pit-floor, hout-roads, and plant area smooth and free of loose rock for high-speed, low-cost, safe operation.

ing or pushing jobs is usually spent backing up. On scattered assignments, tractor's fast travel and working speeds increase output by 50% to 100% over the *fastest* crawlers!

Costs less to operate

With enclosed anti-friction drive and fewer moving parts, Tournatractor is better protected from grit and wear — will give you higher efficiency through more hard-working hours of continuous service.

Tournatractor rolls on only 4 rubber-tired wheels...compared to about 560 moving crawler track parts. In many materials, unit's big, pneumatic tires outwear tracks by as much as 2-to-1. In highly abrasive materials, tires often give up to 4 times the service of tracks.

Try Tournatractor in your pit

Why not let us arrange for a demonstration? Put Tournatractor to work in your pit, and see for yourself how this rubber-tired tractor can help out clean-up and maintenance costs. Write for full details.



LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

"DUSTLESS" S 20 STOPER is available with 28-, 46-, and 64-in. feeds... weights; 65, 78, and 88 lbs. It can be used for fast, dustless roof-bolting wherever a man can crawl!



LE ROI S 20 STOPER

DUSTLESS

• drills in 26-in. coal • delivers lightweight power • cuttings never pass through stoper

The thousands used in coal mines prove that the Le Roi S 20 Dust-Collecting Stoper is the shortest, lightest, and the only practical stoper for 26-in. seams!

Le Roi's Vac-Nu-Matic® dust-collection is fast, positive — reduces wear on men and machines. Perfect dust removal minimizes rotational drag, eliminates stuck steel, and speeds drilling even in soft, wet formations. The S 20 removes dust through the chuck housing — not through the stoper — drills deeper with one steel change than conventional stopers can with two! Its design permits chuck changes without dismantling the machine.

Call your Le Roi distributor for more information — and a demonstration. Or write to Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin.

LE ROI NEWMATIC AIR TOOLS



PORTABLE AND TRACTAIR AIR COMPRESSORS . STATIONARY AIR COMPRESSORS . AIR TOOLS
Distributed in the Coal Fields by: Acme Machinery Company, Huntington, West Virginia, and Equipment Service Company, Inc., Birmingham, Alabama.

AT-903

Coal Screens And Screening

Functions of Screens

Equipment Available

Installation of Units

Maintenance for Efficiency

Buying Guide

Coal Screens and Screening

Functions, installation and maintenance of sizing and conditioning equipment and materials in coal preparation are important considerations in achieving high efficiency at controlled costs.

OF THE HALF-BILLION TONS of material annually produced by the coal industry, a figure that is sure to grow, almost 65% is mechanically cleaned, necessitating the use of screens at a number of stages in the cleaning process. The remaining 35% of this annual production will more than likely pass over one or more screens for scalping, rough cleaning, etc., including final sizing, before it reaches the ultimate consumer. Furthermore, this half-billion-ton-peryear stream of material can be highly corrosive and abrasive, thus increasing the frequency of screening surface replacement.

Operators of coal-preparation plants can effect real savings in processing costs and in labor costs for screen maintenance and surface replacement in direct proportion to the study devoted to screening machinery and screen-surface materials and configurations. Designed as a takeoff point for such studies at particular plants, this entry in the *Coal Age* series of Operating Guides is a roundup of:

- 1. Screen functions,
- 2. Equipment available,
- 3. Installation hints for better performance,
- 4. Maintenance for maximum efficiency.
- 5. Suppliers of screening equipment.

Screen Functions

The five most important functions of screening in coal-preparation plants

- 1. Conditioning the stream of material for subsequent treatment, including thickening, etc.
- 2. Dewatering as a final step or as a prelude to centrifuging or thermal drying.
- 3. Desliming, for example on launder screens or fixed sieves of various

types, to provide an additional boost in quality through the removal of high-ash fines or to control the solidswater balance in the cleaning water.

- 4. Reclamation of heavy media, such as sand or magnetite.
- 5. Final sizing of clean coal into marketable fractions.

These functions may be performed in rotary, vibrating, shaking or stationary units, depending upon such factors as the job to be done, volume and weight of materials to be handled, degradation-control requirements, floor space and headroom in plants and the spread of sizes in the feed to the screens.

Screens as Conditioners

Choice of equipment for the initial conditioning of raw coal depends upon whether this conditioning is primarily a rough-cleaning operation or a scalping operation. If rough cleaning is the primary object the rotary breaker is a possible choice, since it will prepare a top size in coal and remove oversize rock. If scalping is the object, with follow-up picking of the lump material, then the shaker may be selected because the picking table can be an extension of the shaker. On the other hand, if the raw coal contains a high proportion of heavy refuse, such as might be encountered in coal produced from breast-and-pillar methods in steeply pitching veins, there is probably no substitute for the heavy-duty bull shaker.

Where the problem of handling refuse in the raw coal is not so critical, a heavy-duty vibrating screen may be applied. In some instances the vibrator can be operated to discharge an overproduct consisting entirely of larger pieces of refuse. In the latter event it would be economical to blank that portion of the screen surface which carries rock only, and discharge directly to refuse. Observation of the screen in action will define the possibility of doing this.

In other applications, the stationary gravity-bar screen or vibrating grizzly can be used to unload smaller sizes and provide an overproduct to feed a crushing operation. Freedom from large-size rock in the raw coal is a

What the manufacturer will want to know when you order a screening machine

- I Full description of material to be screened, including
 - (a) Name and type of material
 - (b) Weight per cubic foot
 - (c) Physical characteristics
 - 1—Hardness
 - 2-Particle shape
 - 3-Flow characteristics
 - 4-Percent moisture
- II Normal and maximum total rate of feed to screen
- III Sieve analysis of screen feed, including
 - (a) Percent coarser and percent finer than point of separation
 - (b) Maximum lump size
 - (c) Complete sieve analysis

- IV Separations required and purposes
 (a) Slotted or rectangular openings
- V Screening dry or wet
 - (a) If wet, state limitations on water supply

VI Circuit information

- (a) Method of delivering feed
- (b) Open or closed circuit
- (c) Open or enclosed screens
- (d) Flow sheet or description of related equipment

VII Other factors

- (a) Previous screening experiences with the material
- (b) Operating hours per day
- (c) Power available
- (d) Space limitations

requirement to achieve maximum efficiency in the crushing operation.

As a matter of practical fact, the degree of primary conditioning required and the units that will be used are functions of the washing operation that follows the raw-coal conditioning. The range of sizes that can be handled satisfactorily by the cleaning equipment is a critical consideration in determining the types and degrees of complexity of primary screens. Whether the smaller sizes are to be air-cleaned or washed also is a matter of critical importance in selecting and arranging primary-screening facilities.

Particularly in anthracite, the emphasis may be on washing rather limited size ranges in separate vessels, although heavy-media systems and sand-flotation cones are effectively washing spreads such as 31/4x3/16 (egg through barley). However, other washers, in both anthracite and bituminous, are more limited in this regard. In any event shaking screens and vibrators are preferred for this primary screening. Again, the choice would depend upon the nature of the feed, its volume, rock content, etc., and the number of size splits it is necessary to make. Shaking decks can be stacked tier on tier and operated by a single drive. And vibrating screens also can provide multiple decks along with flexibility of multiple

Usual practice with shakers is to provide a declination of approximately 15 deg from feed end to discharge, and to operate with a 4- to 6-in stroke at a speed of 100-120 strokes per min. One anthracite installation employs eccentrics at 90-deg intervals to energize four shaking decks with reduced stress on the eccentric shaft. Screen surface materials for this service consists primarily of perforated plate on upper decks, and plate, woven-wire or wedge-wire panels to handle smaller sizes.

The life of screen surface materials is a matter of compromise among such factors as (1) percentage of open area needed to achieve a desired capacity per square foot of surface and (2) optimum plate thickness with regard to size of opening that will result in maximum screening efficiency. A portion of screen life must be sacrificed to both capacity and efficiency. Plate thickness is not so critical where apertures are large, but in screening

The Value of Screen Observation

Observation and evaluation of screen performance can return handsome savings, as demonstrated by events at a West Virginia plant. In this instance, 1/4x0 was removed for air cleaning from a 6x0 raw-coal feed on a primary vibrating screen. This was a double-deck unit with 1/4-in-round perforated plate on the top deck and 1/4-in stainless-steel cloth on the lower deck. The object was to perform a scalping operation on the top deck and to make the separation at 1/4 in on the lower. Blinding occurred when the moisture content of the coal reached 8%. screen life was short and holes developed, resulting in loss of stoker coal into the less valuable carbon.

A big boost in overall screening efficiency was achieved when the primary screen was converted to a single-deck unit dressed with wedge-wire jackets having an aperture of 3.327 mm. Blinding was virtually eliminated, screen life was increased by 500% and losses of stoker coal ceased.

However, the company found that this is not a universal solution. The same procedure was tried at another plant handling softer coal containing less volatiles. This screen handled $^3\!/_4$ x0 feed, and apparently there was not enough coarse material to scour the surface. Blinding was worse with the wedge wire than with the $^1\!/_4$ -in stainless formerly used.

in the finer ranges the difficulty of getting particles through the holes increases with increasing thickness for a given aperture size. This is a qualitative consideration, analogous to the difficulty that can be encountered in trying to pour solids through a pipe. Particles with one long dimension may become canted in the opening to block the flow.

Fixed sieves following the washing operation also can be classified as conditioners in that water and fines can be removed from the stream of clean coal to facilitate later dewatering and to clean up recirculating water to some extent. These sieves are normally made of wedge-wire panels or the various types of rod panels.

Rescreening normally is a job for vibrating units. The vibrator fed from the main sizing shaker is the most commonly used rescreening system in bituminous practice. Rescreens are also arranged to receive material from clean-coal crushers to size stoker and other specialty sizes when the natural output of the mine does not satisfy these needs. As a final conditioning step, lip screens may be employed in loading chutes to remove degradation as the coal is loaded.

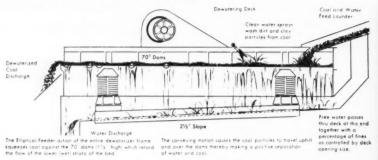
In anthracite practice the stationary launder screen, or "riffle trough," is used at a number of points in washing circuits to condition both raw coal and clean coal. They are especially useful in plants where feed and products are handled in slurries by pumpand-pipeline systems. Such installations are more fully discussed later in the section entitled "Riffle Screens."

Much of this conditioning work, especially in the primary phases, is heavy-duty screening, naturally leading to rapid plate wear. It has been found advantageous by some operators to cut off less-worn sections from panels in which most of the wear is concentrated at the feed end. Full panels then can be made from the reclaimed sections. Another possibility for preventing excessive wear in special cases consists of welding longitudinal skid bars or angles on the top of the screening surface to slide larger pieces of rock above the screening surface directly to refuse. Wedge-wire and wedge-bar panels are now being made with built-in slide bars.

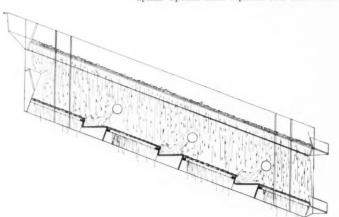
It might also be determined whether corrosive water from sprays is concentrating surface wear at a certain point. Corrective steps that could be taken include neutralization of the water, periodic relocation of sprays or a change to corrosion-resistant materials. In the latter, the higher cost of the corrosion-resistant materials must be recovered in longer life, sometimes in the ratio of 10 to 1, if, for example, the change is from plain steel to stainless.

A relatively new starter in this field is "pool-washing," in which the screening surface at the point of impact of the sprays is unperforated. These portions of the screen panels also are depressed to form pools in which the coal remains for a moment to permit

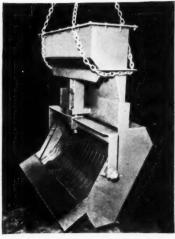
Coal Screens and Screening



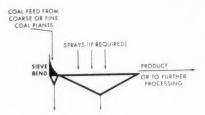
DEWATERING DECKS usually operate horizontally or slightly uphill. Special dams separate coal and water.



RECESSED POOLS on lower deck provide for repulping of material to permit better removal of extreme fines.



BENT SIEVE conditions stream of solids and water with no power consumption.



RELIEF of an overloaded screen is one application of bent sieve.

better washing of fines from the larger pieces. Increased efficiency in media recovery also is an advantage of pool washing.

Especially in anthracite preparation the appearance of the finished product, particularly in the domestic sizes, is vital. This calls for the removal of "flats," the dull, flat pieces that meet gravity specifications but because of their shape are undesirable in the product. Special screen sections, usually termed "flat pickers," installed near the discharge end of final-sizing decks, permit the flats to slide through while retaining equi-sided pieces on the deck. The flats usually are crushed to release smaller sizes, thus eliminating any penalty in total yield.

Dewatering, Desliming

Stationary, vibrating or shaking screens are employed in a variety of ways to draw off water from a stream of coal in process. Primary objectives of screens in this application are:

1. To perform a final dewatering step prior to loading or storage.

2. To remove moisture as a preliminary step to final drying in mechanical or thermal drying units.

3. To remove high-ash extreme fines along with the removal of water. At one plant (*Coal Age*, September, 1957, p 76), a horizontal vibrating screen with ½-mm openings receives ¼x0 and produces ¼x28M. Overproduct goes to centrifuges and underflow returns to settling tank from which overflow with fines is pumped to sludge pond.

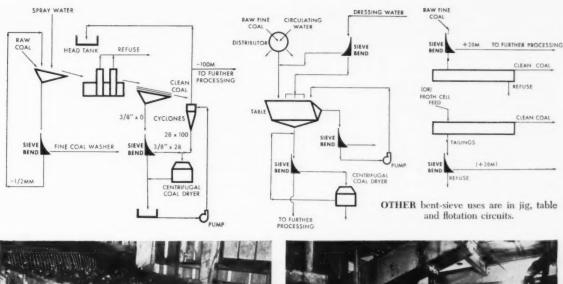
The objective will govern the selection of equipment from a list that includes bent sieves, radial screens, fixed sieves, launders, shaking screens and vibrating screens, the latter with dams or pool-washing decks.

Installation and operation of vibrators and shakers in a dewatering application differ somewhat from those for a straight sizing operation. The usual practice with vibrators is to operate them horizontally or even slightly uphill in the direction of material flow. The one stipulation is that a bed of material must be formed and maintained on the screen surface to

promote effective dewatering. This can be done most simply by constructing angle-iron dams across the screen at panel junctions and at the discharge end of the screen, assuming that screen width has been carefully determined on the basis of volume of feed. The dams help create a squeezing effect within the bed to wring out some of the moisture. They also disturb compacted beds as required to permit accumulations of water on top of the beds to pass through the screen.

A similar effect may be gained by using stepped screen panels to tumble the coal as it passes over the screen. In some applications the stepped-screen panels are reversed.

Experimentation with these possibilities and with the pitch and speed of the screen will be helpful in arriving at optimum dewatering conditions with vibrators. Normally the speed of the screen is high, and the stroke is short and at 45 deg with the deck to facilitate conveying action. Wedge wire, conventional woven wire and woven wire with elongated openings are widely used in dewatering, along







PARTICLE SHAPE can be utilized to make a separation, as on this "flat picker" panel on an anthracite shaker.

RADIAL SCREEN is fed by a cross distributor which is powered by the entering stream of material.

with perforated plate and flanged lip screens with tapered slots. The type of panel and its area will determine whether backup grids or bars should be used underneath to reinforce the screening surface.

When shaking screens are employed in a straight dewatering application, the speed usually is increased to about 400 rpm and the stroke is reduced to about 1 in. Normal practice is to support the screen from below on springboards which are inclined at about 70 deg with the horizontal to raise the bed and move it forward with each oscillation. Declination of the screen in the direction of material flow is about 3/4 in per ft. Screen panels in anthracite dewatering consist mainly of perforated plate. In bituminous, when dewatering at, say, 28 M, cloth, rod or wedge wire is employed. Where slivery particles are to be retained in the overproduct, one is pretty well limited to the use of standard square mesh or S-curved wedge-wire panels in sizing or dewatering.

The bent sieve and radial screen

normally perform the dual functions of desliming and removing excess water. However, in most flow sheets these units are followed by other types of equipment to further reduce moisture. The launder, or riffle, also is used for these purposes, especially in anthracite preparation plants.

Media Reclamation

In the reclamation of dense-media materials the vibrating screen most often gets the nod, although the radial screen, developed in Europe, has been employed to advantage in U.S. plants for separating sand for reuse in cones. The stream of material entering this unit provides the driving force for the cross distributor which pivots about a central axis to lay the feed on the wedge-wire screening surface. Water sprays wash the sand through the screen. The overproduct is returned to the raw-coal screens. Pool-washing, as mentioned, also is a step to improved media reclamation.

Medium recovery from clean coal, middlings, if any, and reject can be accomplished on a single partitioned vibrating screen, with the position of the longitudinal partitions fixed to provide required screen area proportional to the amounts of coal, middlings and reject. At one anthracite plant, a single shaker setup is used for magnetite recovery followed by final sizing.

Final Sizing

Sizing of coal for the market in modern practice is the last step in preparation prior to loading. However, there are exceptions, principally in anthracite, in which final sizing may precede washing in cleaners of narrower range. In either case, the sizing job is done on shaking screens or vibrating screens, with the latter gaining in popularity.

An effective sizing operation is one in which each particle is presented successively in different positions to screen apertures during its travel across the screen surface. Too few presentations of particle to aperture means excessive undersize in products, and too many can result in excessive degradation. Finding and maintaining the midpoint between these extremes is the essence of the art of coal sizing.

In the ideal situation the particles will be rolled across the screen surface until passage through an aperture occurs or is certain not to occur. Excessive throw of the particles above the screen surface hinders screening and increases degradation. On the other hand, some loosening of the bed must be accomplished to permit undersized and near-sized material to get down to the screening surface, and this requires some throw. Again, the goal is to strike a balance.

Time of retention on the screen, therefore, is an important consideration, and this is a resultant of volume of feed to the screen, size consist of the feed and the speed, stroke and pitch of the screen, all of which are amenable to some measure of control by the operator. Shape of the particles may require the use of special panels, such as, taper-slotted (usually stepped) or flanged step sections for removal of flats, as previously mentioned. Time for accomplishing the separation is essential but excess retention increases degradation, screen wear and power consumption.

The No. 1 complicating factor in sizing is moisture. This is especially troublesome in the finer sizes but it is also annoying in that it may result in carryover of fines on the larger sizes. Effective screening can take place with dry materials or with wet materials, but not with moist materials. In fact, the dewatering operation on screens is based on the principle that screening stops when the bulk of the moisture leaves the material, thus permitting a bed to form even though some of the material may be finer than the screen apertures.

Wet screening, including both prewetting and spraying on the screen, continually repulps the material to better expose fines to the screen surface. Pool washing, as previously mentioned, is a possibility here. However, there is a practical limit to the amount of water that can be used for this purpose, and dry-screening opportunities are more a matter of luck than design, beginning with dry run-ofmine. Sooner or later the operator will be faced with the problem of classifying the moist smaller sizes on screens. This brings up the matter of screen blinding and its causes and palliatives.

Blinding may occur in either of

two forms. It may result from the "bridging" of fines over the screen apertures, or it may result from an excess of near-size particles in the material to be screened. Obvious solutions, often successful, are longer stroke, higher speed or a change from square- to rectangular-mesh panels, to break up the bridging tendency of fines: or, in problem cases resulting from an excess of near-size material, a change to a slightly smaller or slightly larger screen aperture may help the situation. A switch to one of the numerous types of stepped slotted panels may help. Other possibilities are to increase the stroke to throw near-size particles out of the apertures, or decrease the stroke to prevent particles from becoming tightly wedged into the apertures.

Specific blinding problems may not be so easily solved since the causes may be deeper rooted. Surface tension of the film of moisture surrounding the particles most likely is the culprit, causing the particles to adhere to each other and to the wires in the screening surface. A rule of thumb is that as moisture approaches 6% at screen openings of ¼ in or smaller blinding is certain to be a problem. Possible solutions may be found among the following:

- Electrical heating of the screen cloth is a definite aid. It does not dry the coal but it does provide dry wires to eliminate the bridging of particles that results from moisture-film adhesion.
- Alloy metals resist wetting better than plain steels, and their higher resistance to corrosion eliminates to some extent the blinding that occurs on plain steels after idle periods.
- Wire drawn from stainless steel is smoother because of its nickel content than wires drawn from plain steel.
 The microscopic projections on the latter type of wire can cause troublesome buildup of fines.
- Burrs in perforated plate resulting from the punching operation also can result in buildups that induce blinding. Turning the plate over may alleviate the condition.
- In Europe a number of screen designs have been developed which offer relative motion between individual wires, including longitudinal piano wires or crimped designs as screen surfaces. Sizing is not so precise, but in many instances this is the lesser evil.

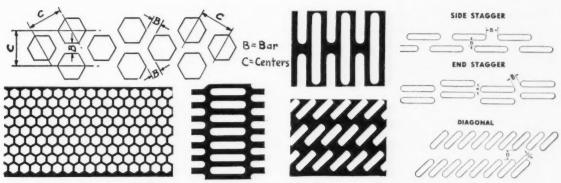
- Ball trays under the screening surface, using round rubber balls on inclined screens and ovoids in horizontal applications, provide a beating action against the cloth to dislodge particles. Modifications of this are suspended chains or ropes above the screen or transverse ropes under the screen.
- Wetting agents may be added to the water to reduce surface tension and substantially increase throughput.
- Oil-treating prior to screening has been found useful in Britain, where the addition of 0.15% of domestic fuel oil increased screenability to a marked degree.
- Atomizing of hygroscopic materials and spraying this over the coal helps to eliminate the enveloping moisture film. Quicklime is an example.
- Recycling coarse material over the screen to reduce average moisture content and to scour the screen surface is a possibility when other considerations permit.

Other possibilities for reducing or eliminating the problems associated with screen blinding include (1) bypassing fines around the washer if the quality of the fines or certain fractions thereof permits later mixing with the washed coal and (2) pre-drying of fine coal. Pre-drying is recommended in many instances where ROM is moist but air cleaning is calculated to be the best method of preparing quality coal. A recent installation of a rotary thermal dryer to handle 2x0 raw coal helped one operator to solve a number of preparation problems, including screen blinding (Coal Age, November, 1959, p 118).

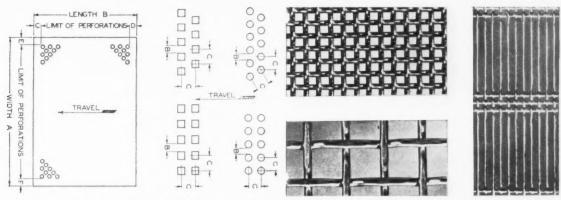
Equipment for the Screening Job

Screening equipment includes the main frames, moving and stationary, and the panels which are attached to these frames to provide the screening surfaces. Auxiliaries include conveying arrangements that may be attached to and propelled by the screens, screen-feeding chutes or surge boxes and discharge facilities. The most convenient breakdowns of the extensive lists are those based upon functions and drive methods.

A major difference between shaking and vibrating screens is that the shaker can be employed to convey and distribute the materials in proc-

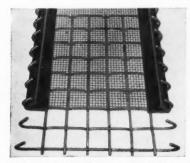


CLEAR SPECIFICATIONS are important in ordering panels. Send a blueprint, if possible.



LIMITS of perforations on punched plate must be clearly shown. Also state desired angle of hole staggering.

SPECIFY wire diameters, dimensions and shapes of apertures in ordering woven screens of any type.







SPECIAL-PURPOSE panels include smooth-surface backing grids for smaller-opening panels, double-taper bar decks for ready clearance in scalping and differentially sloping rod decks for making difficult separations.

ess-for example, to provide an opportunity for hand picking.

Vibrating screens comprise two major classes: (1) those that operate in rectilinear vibration and (2) those that operate with circular or elliptical motion. Examples of the former are those that are actuated electrically, electromagnetically or mechanically either in harmonic or unsymmetrical motion. The second class, rotor-vibrated machines, includes those driven by eccentric shafts and the unbalanced throw machines. The latter get their motion

from unbalanced rotors mounted on the main frames of the screens.

In a class by itself is the "resonant" machine, in which a small exciter provides the initial operating impulse and a reaction system amplifies until the natural frequency of the system is reached. The reaction system may consist of springs or pneumatic chambers. The principle is employed on very large vibrating machines, up to 6x28 ft, for most applications, including conveying and distribution, sizing, dewatering and so on.

Screening Surfaces

There is an almost infinite number of screen types and screen openings available to preparation-plant operators, either in manufacturers' stocks or furnishable to the specifications of the customer. These include punched plate, woven rod, woven-wire cloth or wedge-wire, bar or rod, depending upon the applications in which they are to be used. Solutions to many screening problems may be found through a thorough evaluation.

Perforated Plate

Capacity is largely a function of the screening surface, although it is an elusive quantity to pin down. A number of variables are involved, including the nature of the material to be screened, its size consist, and its density. Furthermore, capacity and life of the screening medium are in mutual opposition. Maximum capacity requires maximum open area, which means shorter life.

There are, however, some empirical guides that can be used to arrive at design figures. The following are based upon dry screening of coal (50 lb per cu ft) containing 50% of material that will pass through.

Square Opening, Inches											Capacity, Tor per sq ft per h						
1/8									۰								7/16
14			*		*		*		*		×			*			3/4
1/2		٠				0					,			٠			1 1/2
34		٠				0	۰			۰	0						15/8
1																	1 7/8
114	×	*		×		*		×		×	×.	×					214
2																	236

Percentage of open area defines the relationship between the remaining metal and the perforations in a plate. The width of metal between two perforations is known as the "bar," and the following tabulation shows how percentage of open area is affected by width of bar and arrangement of perforations:

Arrangement of Perforations

		Straight Round	
Bar equal to perforation size	22%	20%	25%
Bar equal to	22 10	2070	2370
½ perfor- ation size Bar equal to	40%	35%	44 1/2 %
½ perfor- ation size	51%	44%	56%
Bar equal to		, ,	70
1/4 perfor- ation size	58%	50%	64%
Bar equal to % perfor-			
ation size	63%	54%	6916%

Square openings provide maximum open area but shortest life, and oblong slotted openings provide even more open area for the same thickness of bar. Therefore, screen capacity, screen life and the total screening area that must be assigned to a particular screening job are completely interlocked factors in design. In striking a compromise among these factors, experience will be of immense value, including the design experience of the manufacturers of screens and screening machinery.

In addition to the more common openings, perforated plate can also be furnished with hexagonal or square-round openings. The panels may be flat, corrugated or diagonally slotted (to hinder straightline travel of particles) or flanged to tumble the material. Flanged lip screens with tapered slots are available with openings as small as ½2-in round-hole equivalent for dewatering and up to 16-in round-hole equivalent for scalping. Most accurate sizing is obtained with shorter slots.

A new development is rubber-clad perforated screen plate that gives long life under severe conditions of abrasion. A high-quality rubber, in thicknesses from 1/16 to 3/4 in, is vulcanized to the plate prior to punching. Screen life has been increased over other screening surfaces in ratios from 7:1 to 20:1. In another type, the rubber is produced as a perforated plate then reinforced by a metal grid at the bottom. Square- or oblong-hole types are available, and the tensioning of the rubber on the metal framework is said to give accurate sizing. Panels can be mounted on any screening machine.

Another recent addition to the line of screen panels is a pierced plate, made by a patented process, featuring trapezoidal holes and a surface configuration which is said to give longer life. The plate is available in several degrees of smoothness, depending upon the application. Materials include carbon steel, stainless, copper, brass or aluminum.

Woven Wire

Perhaps the most widely used of all screen surfaces are the woven-wire types because of the almost unlimited number of patterns that can be evolved. A great degree of flexibility in size and shape of opening can be achieved through variations in wire diameter and weaving techniques.

Strength, dimensional stability of openings and surface smoothness can be woven into these panels, depending upon wire diameters and the use to which the panels will be put. The arch crimp, for example, is a weaving method that locks each wire in place

so that uniform openings are maintained for the life of the screen. It is most often used when width of opening is at least three times the diameter of the wire. Where wire size is larger in relation to opening size the double-crimp method of weaving is used. Where a woven panel with one smooth surface is required, such as in backup service for a smaller-opening screen, the crimps in both warp and shoot wires are made in one direction.

Wire also can be woven with elongated slots for use in applications where blinding is a problem or where particle shape influences screening efficiency.

Recent reports tell of the use of woven wire as a screening medium for some of the larger sizes of anthracite traditionally handled on punched plate. At one plant, three decks of a 4-deck shaker are dressed with stainless woven-wire panels. The top deck retains buckwheat and larger sizes, and the three woven-wire decks retain rice, barley and buck No. 4, respectively, with jackets as follows:

Rice -4x4 mesh, 0.080-in wire, 0.170-in opening.

Barley-8x8 mesh, 0.035-in wire, 0.090-in opening.

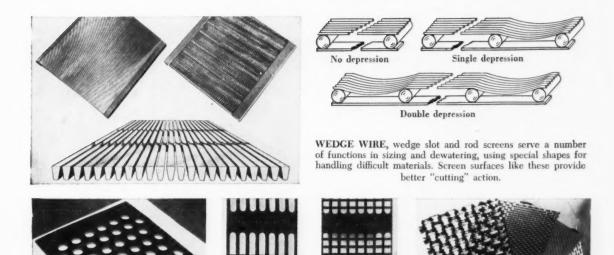
Buck No. 4-18x18 mesh; 0.017-in wire, 0.039-in opening.

The results have been longer screen life, high capacity and increased screening efficiency. Furthermore, openings can be furnished in various sizes according to the nature of the coal and other variables.

The screening capacity of woven materials depends upon a number of variables, such as size consist of the material to be screened, its moisture content, its specific weight and whether the process is wet screening or dry. The accompanying tabulation is based upon a set of assumed conditions, as follows:

The coal (50 lb per cu ft) is dry and the screening process is dry; the feed contains 50% oversize and 25% less than one-half of opening size, and square openings provide 50% open area.

Cle Sq		Siz												7		ons per Hr Per Sq Ft
	14	Μ.														0.15
	10	Μ.					۰								۰	0.19
	8	Μ.								٠						0.24
	1/8	in.						0								0.29
		in.														
	3/8	in.									۰				0	0.60
	1/2	in.	۰						٠			۰	۰			0.70
	3/4	in.			۰	0							٠			0.90
	1 i	n							۰				۰	0		1.20



RUBBER SHIELD bonded to punched plate (left), perforated rubber reinforced by steel and trapezoidal punching of plate may provide answers to unusual screening problems such as high abrasion or difficult dewatering.

Surface moisture in the coal, especially in the finer sizes, will reduce this capacity, although wet screening may increase capacity up to 100%. Increases in near-size particles in the feed will reduce capacity, as will an increase in oversize which hinders smaller particles from reaching the screening surface. Whether the operation of the screen is with the flow or counter to it will affect capacity. Again, as in figuring capacity with perforated panels, the experience of the operator and of the manufacturer of the particular screening machine are indispensable. If the feed rate exceeds the capacity of the largest unit available, the use of multiple units must be arranged.

Averages of size analyses and the expectancy of average conditions should not be used as the only bases for calculating screen capacities. More important may be the time duration of undesirable screening conditions, such as fluctuations in feed rate or size consist with time.

Wedge Wire and Wedge Bar

Lateral and vertical mechanical strength, free clearance characteristics and long wearing life are features of "wedge wire," one of the outstanding developments in screen-surface design. A number of designs are available,

including those with straight slots or tapering slots (widening in direction of material flow); those with S-shaped slots for screening out slivery material; corrugated or single- and double-depressed wedge-wire or rod panels to prevent too-rapid flow of coal across the surface, and panels in which the top surfaces of the wedge wires are embossed to agitate the coal and promote improved dewatering. Also available are panels with slide bars built in to carry large pieces above the main screening surface to the discharge end.

Wedge wire is drawn to shape, then coiled at intervals of approximately 4 in to receive cross rods. Wedge bar, on the other hand, is drawn continuously and usually held in place on U-shaped supports to provide an unobstructed lengthwise opening. The size and profile, in either case, depends upon the duty of the screening surface and unusual conditions that might be encountered.

As with other types of screen panels, wedge-wire and bar surfaces can be tailored to a customer's specifications, especially with regard to end finishes for mounting to screening machines. Descriptive literature on wedge-wire and bar availability and applications may be obtained from manufacturers listed in the buying directory accompanying this Operating

Guide. The list of materials from which the panels can be made includes mild steel and stainless steel, bronze and silicon bronze, brass, nickel, monel and others.

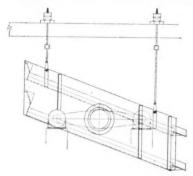
Cost comparisons among the various screening media are extremely difficult to make, except perhaps for those which handle coarse materials. When it comes to surfaces for screening smaller sizes, each is best fitted for a particular application. A hint from manufacturers is that more screen is broken than worn out, and the breakage usually is a result of improper tensioning of the jacket to the screening machine.

Bar and Rod

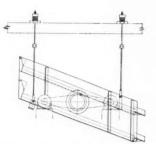
Assembled rod and bar screens provide another area of selection to the screen operator. As with most other types of screen panels, these may be procured in the alloys or in tough oiltempered steel or abrasive-resistant spring steel. Large rod and bar decks feature high capacity in heavy-duty applications such as scalping. Their cutting action is of value in handling sticky or difficult-to-screen materials. Stepped designs are available to tumble the material on the deck to gain higher screening efficiency.

Double-tapered bar decks, tapered back to front and top to bottom, are

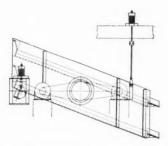
Coal Screens and Screening



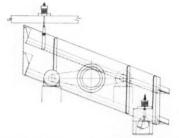
Standard overhead cable suspension.



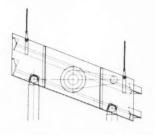
Cross beam at feed end for extended cable centers and standard cable suspension discharge end.



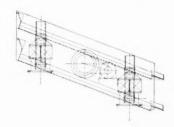
Cable suspension discharge end, floor mounted feed end with cross beams and floor stands.



Rod or cable suspension feed end, floor mounted discharge end with cross beams and floor stands.



Cable suspended with separately mounted friction checks. (Recommended when screens are operated with increased throw and installed in limited space.)



Trunnion type spring floor mounting at feed and discharge ends. Soft springs provide maximum vibration isolation.

IN SUSPENSION INSTALLATIONS of screens of this type it is recommended that at least 16 in of free space be provided from top of feed end of screen to top of supporting member and that discharge-end rope is a maximum of 12 ft in length.

particularly suitable for difficult scalping jobs.

In handling the finer sizers, round or wedge rod screens similarly offer an improved cutting action for sizing or dewatering.

Screen Installation

Properly installed vibrating screens will transmit little or no vibration to the plant structure. This assumes that snubbing devices are used, when called for, to prevent a buildup in the amplitude of the screen during starting or stopping periods. These snubbers, which are primarily used on screens having a large throw, may be mechanical friction checks or electrical controls to reverse motor torque as a screen slows down.

Vibrating screens may be basemounted or suspended, or a combination of both methods may be employed, as shown in an accompanying illustration. Ordinarily, a screen handling heavy loads should be base or floor mounted, either on springs or the newer pneumatic cushions. The manner of mounting often will be dictated by such factors as available room in the plant, structural features of the plant and feed-and-discharge circuit considerations.

Above all, a screen should be carefully handled as it is hoisted into place. Slings should be used to provide equal lifting force at all four corners of the machine. This will prevent distortion of the body assembly. Accurate mounting dimensions will be furnished by the manufacturer of the screen, and it is recommended that a 2-in clearance be provided all around the live frame of the machine.

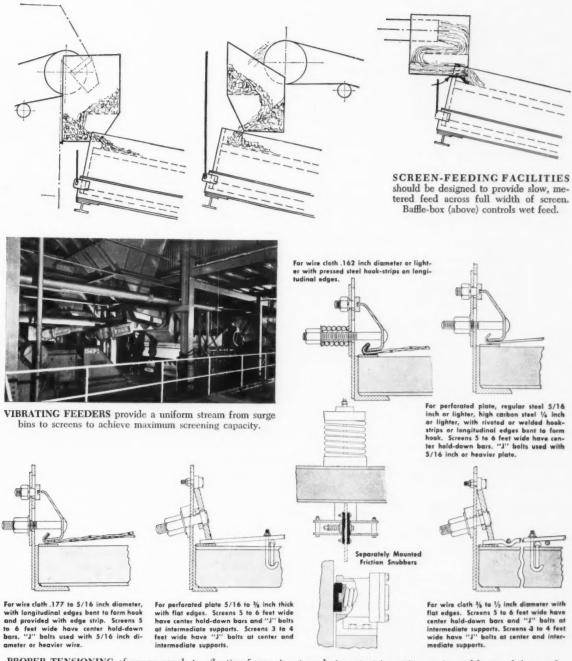
The recommended wire rope for suspension installation is 6x19 plow cable. The placement of stabilizer blocks to prevent cable whipping will depend upon the throw of the screen and the diameter of the cable. Springs should be used on the tops of supporting stringers with suspended screens.

In vibrating screen installations where the primary function is sizing, the usual range of inclination is from 12 to 14 deg (more or less with some types) for rotation in the direction of material flow. Machines may be installed at from 17 to 21 deg for counterflow rotation. The latter is not rec-

ommended for any installation in which a coarse scalping operation must be accomplished. Where coarse screening is to be done, say 3-in opening or greater, it is better to run the screen forward. This provides an ejection force to throw near-size pieces out of the holes and on down the screen. In counterflow operation these pieces would become more firmly wedged in the large holes. Counterflow operation is recommended when screening through 1½-in holes or smaller.

Shaker Installation

The shaker screen, for raw-coal sizing, is usually inclined at approximately 15 deg with a crank or eccentric drive providing a stroke of 5 to 6 in at 100-120 strokes per min. The Parrish-type (flexible-arm) screen, operating at higher speed (150 to 185 rpm) and lesser slope (2 to 5 deg), finds its major use in final sizing or dewatering. In multiple-deck sizing shakers the usual practice is to suspend the decks from hanger boards, and in single-deck dewatering applications the flexible supports may be



PROPER TENSIONING of screen panels to vibrating frames is extremely important in getting maximum life out of the panels.

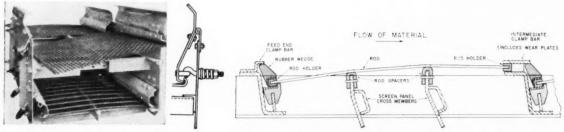
Improper tensioning leads to premature breakage of panels through metal fatigue.

underneath the screen. In the latter case the speed of the screen may be increased up to, say, 400 rpm.

A more recent development is the shaker hung on wire ropes, a system under which minimum vibration is transmitted to the structure. This type is propelled by a drive that employs the principle of rotating counterweights to retain stresses within the drive unit itself. Single or double units may be used; if double, the opposed shakers discharge to a common central chute.

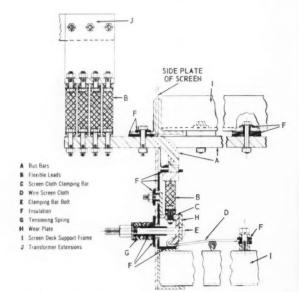
Quality and consistency in action of the suspension boards are two of the more important considerations in using Parrish-type screens. Pairs of boards should be closely matched in dimensions and in elasticity. Any differentials in these factors can result in bending of the main frames of the shaking decks, causing premature breakage of side panels or poor screening action. One solution adopted by an anthracite producer is to use springboards made of a laminated

Coal Screens and Screening



QUICK-CHANGE FEATURE is a timesaver where size specifications change often.

INDIVIDUAL RODS can be replaced or rod spacing changed on screens equipped with rubber seats and wedges for rod ends.



PLASTIC SPRINGBOARDS will reduce shaker downtime.



WORKMANLIKE INSTALLATION of screen heaters is vital to good performance and maximum safety.

STATIONARY LAUNDERS find increasing use, especially in anthracite, for solids-water adjustments.

plastic which was originally developed for use as an insulating material. The material is dimensionally stable and uniform in quality.

Feeding Facilities

Screening at a consistently high efficiency requires some means of providing a uniform feed to the screen and presenting that feed to the screen with a controlled drop and limited speed. Size consist and volume of feed to the screen will have bearing on the type of feeder selected. It is also advantageous to present the feed in a manner that utilizes the full width of the screen, although the longitudinal crown on a screen surface will effectively spread the feed in most instances.

A simple surge box at the head of the screen is sufficient to meter the feed. Up to half the length of a screen may serve no useful function if the feed enters at too high a velocity. This is especially true where the feed enters with a stream of water. Screening energy is dissipated in slowing down the material.

Magnetically vibrated feeders may be employed to provide uniformity of feed in a wide range of feed sizes. In some instances revolving feed distributors of the type used with wet tables have been installed to feed banks of screens in plants where solids are transported in water.

In any event, it pays to install some type of retarding device, splash dam or otherwise, at the feed end, and to limit the drop of material onto the screen. Such steps contribute to smoother screen operation, better screening and longer panel life.

Screen Heaters

Correct tensioning of screen panels is essential to long life of the panels.

However, when the screening surface is to be electrically heated to alleviate blinding the problem becomes more acute because of the expansion and contraction which results from the changing temperature. In certain screen designs this problem was overcome by tensioning the jackets longitudinally and spring-loading the tensioning bolts. Extra care should be taken in installing heated decks.

At least one screen on the market has been specifically designed for electric heating applications. In this unit only the screen cloth is mechanically vibrated, the entire frame remaining fixed. Thus it is possible to eliminate flexible leads between heating transformer and screen surface in favor of solid bus bars.

In early heated-screen applications it was necessary to disconnect the electrical leads to change screen panels. However, most modern screens are arranged so that panels can be changed without disturbing the electrical connections. It is highly important in the interest of safety to follow instructions to the letter in installing and checking the insulation of a heated deck.

Riffle Screens

The stationary launder screen has found increasing acceptance in anthracite plants in the last decade for desliming and classification, and, in some instances, for cleaning in the bottom size ranges. The device essentially is a long open-top flume constructed of 2-in lumber, bottom and sides. A series of 6x6x6-in wells is built of 1-in material into the bottom of the trough, each well having a discharge orifice drilled through the bottom of the trough at the center of the well. Screen cloth is tacked to the tops of the well walls and the sides of the trough.

When a stream of water carrying approximately 25% solids or less by weight is introduced into this flume—which declines at a dip of from ½ to 2½ in per ft—a separation by size and/or specific gravity can be made. The wells in the flume fill up with the water and solids that pass through the cloth, thus creating a stable head above the discharge orifice to provide a controllable flow through the trough.

Extensive studies of launder-screen applications in the anthracite region by Sanner and Clendenin of the U. S. Bureau of Mines (see Report of Investigations No. 5032, March, 1954) establish the importance of creating a riffling action at the screen-cloth surface. This riffling action results in a reverse classification in which larger particles stratify above the fines in the stream. The trick is to select and install the screen cloth in such a manner that it becomes concave over each well.

The weight of the cloth is important in getting the concavities to form. It should be lightweight and flexible. Bronze screen cloth is preferred where the acidity of the water is low, but where acidity is high stainless steel may be required. If this is the case, a smaller wire diameter in the stronger stainless may be chosen. Riffling action may be further improved by tacking wood strips with tapered edges on top of the well walls perpendicular to the flow.

As in many other phases of screen-

ing, success with launder screens depends to a great extent upon judgment, experience and experimentation.

Maintenance

Keeping screening efficiency at a high level requires that the machines and auxiliaries be regularly inspected and receive a moderate amount of maintenance. As previously mentioned, more screen cloth is broken than is worn out in service, and most of the breakage results from improper tensioning of the panels in the frame.

Every panel removed from service should be closely examined to determine whether the wear is normal or if breakage is due to fatigue of the metal. Any whipping of the screen panels while the screen is in operation will lead to metal fatigue. The only possible answer is proper tensioning of the panels. A beneficial byproduct is that harder wire with longer life can be specified where the panel is held tightly in place. However, if the panel is not held down the harder wires will fatigue faster.

It is important in ordering plate or woven panels to specify the type of edge treatment desired. Usually the diameter of the wire or the plate thickness dictates the type of edge treatment and method of tensioning. Wide screens, 5 ft or wider, also are equipped with center hold-down bars in addition to the side or end tensioning clamps. Thick plate, 5/16 in and up, can be further secured by using J-bolts to fasten the plate to the intermediate buffer bars. Tops of the buffer bars should be padded with rubber strips in good condition.

Screen cloth may be installed so that the tension is on the warp wires, the less deeply crimped of the intersecting wires. This will make it easier to maintain the tension.

In fastening a new panel onto a screen it is advisable to begin bolting at the center and work out to the sides. This is especially important in working with wire cloth, since a "hump" in the middle of the panel will whip and break prematurely.

It is good practice also to operate the screen with new panels for a short time, then stop the screen and take up any slack in the tension. Incidentally, running the screen with the tension released is a good way of loosening panels that will not come out easily.

Lubrication is very important. In servicing vibrators equipped with oillubricated bearings it is necessary to maintain the proper oil level, no more, no less. Over-oiling may force oil through the inner seal into the housing of the shaft. This can contribute to hard starts on cold mornings. Fine dust will in time infiltrate. Therefore it is a good idea to flush the bearings by draining the oil, filling with kerosene and operating the screen for about 10 min. The kerosene is then drained and fresh oil is installed.

Some screen bearings are designed for grease lubrication through a highpressure fitting. Old grease is thus flushed out through labyrinth seals, taking any dust with it. Lubrication should be checked every day.

Periodic checks should be made to determine whether the screen is level in the direction perpendicular to material flow. Out-of-level operation shortens the life of the equipment and gives rough screening action. The installation level may be disturbed through settlement of the structure or screen supports or through differential stretching of suspension cables.

Rough screen action may result from conditions other than out-oflevel. Worn bearings, a weak supporting structure or incorrect speed may lead to rough action, but the first check should be screen level.

Body bolts should be tightened at regular intervals, and a close check should be maintained on all bolts in the screen-driving mechanism. V-belt tension and alignment must also be checked periodically.

Acknowledgement

The editors are deeply grateful to the manufacturers of screening machines and screening surfaces for much of the material in this Operating Guide. Their names with the products they offer appear in the accompanying Buying Guides.

Reprints of this Special Report are available and may be obtained as long as the supply lasts at a single copy price of 25c. Write The Editor, Coal Age, 330 West 42nd St., New York 36, N. Y.

Vibrating-Screen Equipment Offered by Key

Condensed data in this tabulation represent normal applications, speeds, etc. In addition,

Manufacturer,		———— Allis-Chalm	ers Mfg. Co., Milw	aukee 1, Wis		Carrier Con- veyor Corp., Louisville 2, Ky.	Deister Con Ft. Way	centrator Co., ne 1, Ind.	Dravo Corp., Pittsburgh 25, Pa.
Type or Model	Ripl-Flo XH	Ripl-Fle 8H	Aero-Vibe AVS	Ripl-Flo S	Low-Head	1	Leahy Model D	Heavy-Duty Model E	Dravo
Primary use	Scalping, ROM screening at 2½-6 in; 16-24-in top feed size	Wet and of 35M-5 in; 8-10-in top feed size	dry sizing at: 35M-1½ in; 6-in top feed size	ing, dewatering	ing, rinsing, drain- , desliming, thick- , etc., at: ½-2½ in dry; 35M-3½ in wet	Special engineered units with variable-rate Amplitrol drive,	Wet and d ³ / ₄ -1 ³ / ₄ - in; 2-3-in top feed size	ry sizing at: 48Mx⅓ in	General wet and dry screening & dewatering to 35M
Sizes available	4x5 to 8x20 ft	3x8 to 8x20 ft	3x6 to 5x12 ft	3x6 to 5x12 ft	2½x8 to 8x20 ft	including dewatering unit	2x4 to 4x8	2x4 to 4x8	4-7 ft wide; 10-20 ft long
Number decks	1, 2, 3 (a)	+	1, 2, 3 as	nd halves			1, 2	1, 2	1, 2
Motion	Circ	le-throw	Circle-elliptical	Circle-throw	45-deg straight-line		← Differential	(5:1) on cloth →	Mechanical, straight-line
Drive	2-bearing off-cen	eccentric shaft,—— iter weight	2-bearing eccentric shaft, counterweight wheels	2-bearing eccentric shaft, off-center weight	Off-center weight		+Toothe	ed cam ———	Exciter, unbalanced segments
Speed	700-1	,000 rpm	1,450-1,750 rpm	750-1,000 rpm	850-1,000 rpm		1,600) vpm	900 rpm
Stroke	%-¾ in	3/4-2/4 in	1/6−1/4 tn	1/6-1/4 in	0.37-0.50 in		·	½ in ———	5/6-3/6 in
Inclination	15-28 deg	15-28 deg	2-25 deg	5-28 deg	0		→ 30-3	8 deg	5-15 deg
Horsepower	73 -40	2-30	2-5	2-73/2	3-25			1	
Mounting		Cable o	r base—air or steel	springs			Base o	r cable	Pedestal or
Manufacturer,	Fairmont P	Machinery Co., Fairr		•	Hewitt-Robin	s, Incorporated, S	tamford, Conn.		Lippmann Engr. Works, Milwaukee 14, Wis,
Type or model	Lecce-Vib Inclined	Lecco-Vib Horizontal	Lecce-Vib Vibr. Conv.	Vibrex MS-7, MS-9, M-11	Vibrex J, JL	Gyrex	Eliptex	hi-G	Screen-All
Frimary use	Wet and dry Screening	Coarse, fine and ultrafine screen- ing, wet & dry, dewatering, etc.	Screening, dewatering, conveying, media recovery	Wet and dry screening	Coarse (J), fine and liquid (JL)	Wet and dry screening	Sizing. dewatering, rinse & drain	Sizing, dedusting, rinsing, etc.	General screening
Sizes available	2x6 to 8x16	2x6 to 8x16		3x6 to 6x16	13/3×23/2 to 4×9	4x6½ to 6x16	3x8 to 6x24	4x10 to 6x28	2x5 to 5x16 ft
Number decks	1, 2, 3	1, 2, 3	1	1, 2 (MS) 1, 2, 3 (M)	1	1, 2, 3	1, 2, 3	2	1, 2, 3
Motion				Circle		Circle-throw	Elliptical	45-deg straight-line	Circle-throw
Drive		Double self- counter-weighted shafts	Dual shaft & springs		ng shaft,———— ed flywheel	Eccentric shaft, counterweight	Self-counter- weighted eccen- tric shafts	Exciter and reaction springs	Eccentric hub
Speed					1,000 or 1,800 rpm	625 or 1,000 rpm	1,000 rpm		800-1,380 rpm
Stroke					3% or 3% in	14 or 1/2 in			
									3/6−3/6 in
Inclination		-6-+6 deg		16-30 deg	16-30 deg	16-30 deg	0	0	3/6-3/4 in 10-30 deg
		-6-+6 deg		16-30 deg	16-30 deg	16-30 deg	0 7½-25	0	

Manufacturers for Coal Preparation Service

many manufacturers offer modifications or special designs for special applications or conditions

Manufacturer.	•	Lin	k-Belt Co., Chicago 9	, III.————		Meckum Engineering Inc., Chi- cago 4, Ill,	Nordberg Milwauk	McNally-Pitts- burg Mfg. Corp., Pittsburg, Kan.	
Type or model	BA	UP	CA, CA-S, CB	NRM	CL	Meckum SKB	Symons Rod Deck	Symons F	McNally
Primary use	Scalping at 2-8 in	Scalping, wet & dry sizing at 50M-8 in	Scaiping, wet & dry sizing, dewatering, me- dium recovery, etc., 50M-1 in	Dewatering, medium re- covery, etc., at 50M-1 in	Wet & dry sizing, de- watering, me- dium recovery at ¼mm-8 in	Wet sizing, 10Mx0	Scalping, general screening	General screening	Fine sizing
Sizes available	5x10 to 6x14	2x4 to 4x10	4x8 to 6x16	2x4 to 4x10	4x8 to 6x20	Custom	3x6 to 6x12	2x6 to 5x16	
Number decks	1, 2	1, 2	1, 2, 3	1	1, 2	1, 2, 3	1	1, 2, 3	
Motion	Circle-throw	Elliptical	Circle-throw	Elliptical	Straight-line	Straight-line	Angled line, vert. ellipse	30-deg str. line	
Drive	2-bearing ed unbalance	ccentric shaft, ed weights	2-bearing unbal, wts. (CA, CA-S), plus ecc. shaft (CB)	2-bearing unbalanced weights	4-bearing double eccentric shafts	Unharmonie resenance	2-bearing throwout weight	Eccentric shaft & springs	
Speed	960 rpm	1,800 rpm	960-1,040 rpm	1,800 rpm	900 rpm				
Stroke	14-34 in	½-% in	3/8-3/4 in	½-⅓ in	1/2-1/4 in				
Inclination	15 deg	15-25 deg	20-221/4 deg	+3-10 deg	0				
Horsepower	20-30	2-3	3-20	2-3	10-25		5-10		
Mounting	Base, coll springs		Coil springs; base	e, cable or both-		Base	Base	Base or cable	

Manufacturer.	Productive Equip- ment Corp., Chi- cage 12, III.	Screen Equipm Buffalo 25, N	ent Co. I. Y.	Smith Engin Milwauk	eering Works, ee, Wis.*	Simplicity	Stedman Fdy. & Mach. Co., Aurora, III.		
Type er model	Gyreset		ece J, S, HS, M, H, D, F	Telsmith	Vibro-King	Simpli-Fio	Gyrating, Simpli-Fio	Horizontal	Dyna-Matie
Primary use	Wet or dry screening, dewatering, etc.	heavy	Wet or dry screening, watering, etc.	Scalping, general wet and dry screening	Wet and dry screening	Scalping	General coarse and fine screening	Wet and dry screening, medium re- covery, etc.†	Wet and dry screening at 1M-10 in
Sizes available	3x6 to 6x16	134x4 to 5x	16	2x6 to 5x14	3x6 to 5x16	2x4 to 7x12	2x3 to 6x18	3x8 to 6x20	2x3 to 4x14
Number decks	1, 2, 3	1, 2, 3, 4 & ha	ilves	1, 2, 3		1, 2	1, 2, 3	1, 2, 3	1, 2, 3
Motion	Circle-throw	Circle-thro	₩	Circle-	throw	Circle	-throw		Circle-thraw
Drive	2-bearing eccentric	2-bearing eccent (D & F), 4-bearing		4-bearing eccentric, with counterweight	2-bearing eccentric, with counterweight	- 2- and 4-bei balanced ec	aring counter centric shafts	Counter- rotating shafts	Eccentric shaft, Counter-balance whoels
Speed									
Stroke	0-% in								
Inclination	-10 to +10	12-21-					15-25 deg	0	
Horsepower	5-15	1-20							1-10
Mounting	Base—springs or air—or cable	Base (rubber) o	r cable	Base, co	il springs	Base, coil aprings	←Base or cable	, coll springs	Base, coli aprings

Vibrating-Screen Buying Guide (Cont'd.)

Manufacturer.	•	——Syntron Co.,	Homer City, Pa.—		←——W. S. 1	fyler Co., Cleveland	14, Ohio	Universal Vibrating Screen Co., Racine, Wis.	NoVo Div., In- dustrial Enter- prises, Chicago 28, III.
Type or model	MCS (Mech. Conveying)	RVS	VSF	SF (Scr. Feeder)	Tyler-Niagara	Ty-Rock	Hum-mer	Universal F, MR, M, C	NoVo Sonic
Primary use	Scalping, wet & dry sizing, dust to 6 in; dewatering	Wet or dry sizing at 100M-4 in; dewatering	Fine sizing, 100M-34 in	Wet or dry screening, feeding, at up to 3/4 in	Wet or dry screening	Wet and dry screening, dewatering	Fine screening, wet or dry	Wet and dry screening at 200M-3 in	Screening and dewatering, 1/4 in down
Sizes available	2x40 to 4x20	3x5 to 6x16	13/2x3 to 4x6	1x3½ to 4½x6	1½x3 to 6x16 ft	2x6 to 6x16	2x4 to 4x8 & tandems	3x4 to 3½x8	11.7-57.9 sq ft & multistory
N umber decks	1, 2	1, 2, 3	1, 2	1, 2	1, 2, 3	1, 2	1, 2, 3	1, 2, 3	1
Motion	Angle straight-line	Ellipse- cirellipse			Circle-	throw		Elliptical	Straight line
Drive	Mechanical, with flat springs	Unbalanced rotor	← Electro	magnetic	4-bearing eccentric, counter-balancing flywheel	Double eccen- tric shaft, counter-balanc- ing flywheel	Electro- magnetic	2-bearing off-center weights	Multiple electro- magnets
Speed	450-600 rpm	900. 1,200 1,800 rpm	← ——3,60	0 vpm				1,800 rpm	60 or 120 cps
Stroke	1/2-1 in	To ¾ in	← 0.45	-0.50					0.3-1.8 mm
Inclination	0-12 deg	= 5-22½ deg	33-3	18 deg	5-25	10-25	30-33	30-45	Variable
Horsepower	5				1-10+			1-13/2	
Mounting	Base	- Base o	or cable	Base				Base, leaf springs; cable	Base or suspension

^{*}Also offers horizontal vibrator. †Also offering new unit for fine dry sizing,

Buying Guide-Screen Heaters

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis .-"Thermo-Deck."

Deister Concentrator Co., Ft. Wayne 1, Ind. "Flex Elex."

F. R. Hannon & Sons, Canton, Ohio-"Hanco." Hewitt Robins, Incorporated, Stamford, Conn. Link-Belt Co., Chicago 9, Ill.

Productive Equipment Corp., Chicago 12, Ill. Screen Equipment Co., Inc., Buffalo 25, N. Y. Simplicity Engineering Co., Durand, Mich. W. S. Tyler Co., Cleveland 14, Ohio. Universal Vibrating Screen Co., Racine, Wis.—

"Unilec."

Buying Guide—Grizzlies. Breakers, Shakers

GRIZZLIES

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. (Model XH).

Link-Belt Co., Chicago 9, Ill. (Model PM). Nordberg Mfg. Co., Milwaukee 1, Wis. (Symons Heavy Duty Rod, Vibrating Bar). Simplicity Engineering Co., Durand, Mich. (Models M, D).

Syntron Co., Homer City, Pa. (Model F). W. S. Tyler Co., Cleveland 14, Ohio (Tyler-Niagara).

ROTARY BREAKERS

Heyl & Patterson, Inc., Pittsburgh 22, Pa. Jeffrey Mfg. Co., Columbus 16, Ohio. Link-Belt Co., Chicago 9, Ill.

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. Pennsylvania Crusher Div., Bath Iron Works Corp., West Chester, Pa.

SHAKERS

Fairmont Machinery Co., Fairmont, W. Va. Hewitt-Robins, Incorporated, Stamford, Conn. Jeffrey Mfg. Co., Columbus 16, Ohio. Kanawha Mfg. Co., Charleston 26, W. Va. Link-Belt Co., Chicago 9, Ill. McLanahan & Stone Corp., Hollidaysburg, Pa.

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. Roberts & Schaefer Co., Div. Thompson-Starrett Co., Inc., Chicago 6, Ill. Wilmot Engineering Co., White Haven, Pa.

Buying Guide-Specialty Screens

Stationary bent-sieve units-Heyl & Patterson, Inc., Pittsburgh 22, Pa .- "Sieve Bend." Radial units-The Nolan Co., Bowerston, Ohio -"Hein Lehmann."

Vertical centrifugal equipment for fine screening -Nordberg Mig. Co .- "Symons V Screen."

Buying Guide—Perforated Plate and Perforators

Manufacturers listed below offer all customary types of perforations in all customary metals, as well as certain specialty items, including those noted.

Cross Perforated Metals Plant, National Standard Co. Carbondale, Pa .- Standard items plus new "Conidure" pierced-metal sheet for screening and dewatering.

Harrington & King Perforating Co., Chicago 44. III.

Hendrick Mfg. Co., Carbondale, Pa .- Standard and special items (including Hendrick "H" quality "heat-treated"), plus flanged lip screens and new Hendrick rubber-clad perforated screens.

Kanawha Mfg. Co., Charleston 26, W. Va. Laubenstein Mfg. Co., Ashland, Pa.-Standard items plus flat-material pickers and desanding and stepped-tread shaking screens.

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. Remaly Mfg. Co., Inc., Tamaqua, Pa. Salem-Brosius, Inc., Pittsburgh 30, Pa.

Buying Guide—Space Screens and Mesh Cloth

Manufacturers listed below normally offer all types of space screen and mesh cloth. Usual material are low-carbon or plain steel, spring steel, oil-tempered steel and stainless steel: others available include bronze, phosphor-bronze, brass, copper, aluminum, monel, nickel and others.

Cleveland Wire Cloth & Mfg. Co., Cleveland 5. Ohio.

Colorado Fuel & Iron Corp., Denver, Colo.; Wickwire Spencer Steel Div., New York 22, N. Y.—"Wissco-Calwico" industrial wire cloth; "Super-Tempered" and "Wisscoloy" "Precision" space screens.

Hewitt-Robins, Incorporated, Stamford, Conn. "Super Gyralloy." "Gyralloy" ("No-Blind" weave available with each).....

Hoyt Wire Cloth Co., Lancaster, Pa.—
"Abraso," "Super-Tough," etc.

Link-Belt Co., Chicago 9, Ill. Ludlow-Saylor Wire Cloth Co., St. Louis 10, Mo.—"Super-Loy," "Ludloy," "Sta-Smooth," "Rek-Tang," "Sta-Clear," "Sta-Tru."

Newark Wire Cloth Co., Newark, N. J. Simplicity Engineering Co., Durand, Mich. W. S. Tyler Co., Cleveland 14, Ohio-"Ty-Loy," "Ty-Rod," "Ton-Cap," etc.-400M to 2 M in mesh cloth; 1/2 to 4 in clear opening in space cloth.

Buying Guide-Wedge Wire, Rod and Bar

WEDGE WIRE

Hendrick Mfg. Co., Carbondale, Pa.—"Flat Top," "Conical Top," "Square Top" and exclusive "Riffle Top": also Hendrick "Wedge Slot" and Hendrick "Cascade Screens" with steps.

Wedge Wire Corp., Wellington, Ohio—"Kleen-slot," "S-Kleenslot," "Kleenslot" tapered, "Might-Tee Kleenslot," "Marcel," plus Twedge "Kleenslot" guard bar.

ROD

Bixby-Zimmer Engineering Co., Galesburg, Ill.

—"Bee-Zee" round rod, grizzly rod, "Tri-Rod," "Iso-Rod."

McNally Pittsburg Mfg. Corp., Pittsburg, Kan. Salem-Brosius, Inc., Pittsburgh 30, Pa.

now there are types of Jeffrey crawler-loaders

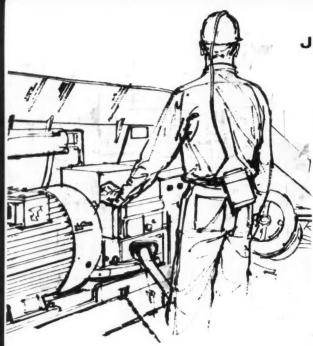
The payoff: for new highs in efficiency, you can apply the crawler-loader whose height, power and loading rate is best suited to the seam.



ONLY 25" HIGH...81C LOADER CLEANS OUT SEAMS WHERE

LOW CLEARANCE MAKES HIGHER LOADERS INOPERABLE. AVERAGE RATED CAPACITY 10 TONS PER MINUTE





JEFFREY CRAWLER-LOADERS

GENERAL SPECIFICATIONS

	81-C	81-AL	81-AH	97-A
Rated Capacity T.P.M.	10	10	10	18
Tram Height	25"	32"	36''	43" or 48"
Overall Length	25'-81/2"	24'-1"	24'-1"	25'-11"
Overall Width	7'-53/4"	7'-53/4"	7'-53/4"	7'-8"
Tram Speed D.C.	137	137	137	160
Tram Speed A.C.	85	85	85	160
Gathering Arm Speed -R.P.M.	55	55	55	53
Conveyor Chain Speed -F.P.M.	372	372	372	360
No. & H.P. Gathering Arm Motors (D.C.)	2 - 15	2 - 15	2 - 15	2 - 25
No. & H.P. Gathering Arm Motors (A.C.)	2 - 20	2-20	2-20	2 - 33
No. & H.P. Conveyor Motors (D.C.)	Uses Ga	thering Arm	Motors	2 - 10
No. & H.P. Conveyor Motors (A.C.)	Uses Ga	thering Arm	Motors	2 - 20
No. & H.P. Tram Motors (D.C.)	2 - 15	2-15	2-15	2 - 25
No. & H.P. Tram Motors (A.C.)	2 - 20	2 - 20	2-20	2 33/8.25
H.P. Pump Motor - A.C. or D.C.	4	4	4	8
Weight in Ibs. approx.	21000	21000	21000	38000

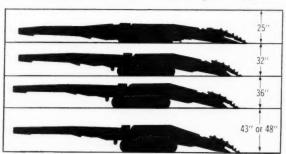
Voltages: Loaders can be built for operation on any of the following voltages: 250 or 500 V, DC; 440 V, AC, 3-ph., 60-cy, 415 V, AC, 3-ph., 50-cy.

these advantages mean lower cost per ton

H Y O T I I

height

Four loaders with five heights, means you can put the correct height loader in the seam height for which it's designed. This assures proper clearance for lumps and convenient height of controls for the operator.



2

power

Available for direct current or alternating current power. Liberal size motors.



3

capacity

Jeffrey Loaders are setting high tonnage records with low maintenance cost and very little down time.



GET COMPLETE INFORMATION-

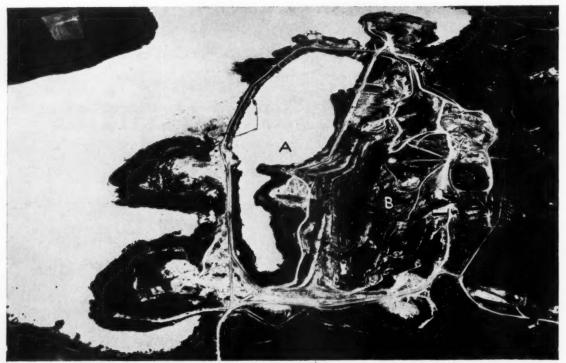
Call or write your nearest Jeffrey District Office.

The Jeffrey Manufacturing Company 912 North Fourth Street Columbus 16, Ohio



His overalls...save overhauls

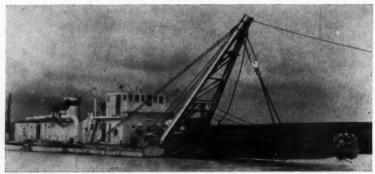




DIKE-ENCLOSED portion of lake (A) is dewatered and desilted, while stripping proceeds at site (B) formerly covered by lake.



COAL PILLARS left after deep mining are exposed by stripping machines.



SUCTION DREDGE dewaters and desilts newly enclosed portion of lake.

Stripping Coal Under A Lake

New Zealand earthmovers pump portions of a lake behind levees to make open-pit mining possible. Floating dredge is used to remove lake-bottom silt before stripping. A UNIQUE coal-mining operation is underway at Kimihia, Huntly, New Zealand, where a lake is being moved to permit the stripping of underlying coal.

For 30 yr to 1912 coal was extracted from a seam 60-180 ft below the bed of Lake Kimihia, a shallow sheet of water about 12 ft deep. In this underground operation, about three-fourths of the coal was left to provide natural pillars to support the mine. The Taupiri Reserve Mine, as it was named, was closed down in 1912 for economic reasons. The mine was abandoned for 30 yr until 1942 when World War II prompted its reopening to help alleviate a growing shortage of this vital product.

Levee Is Formed

Underground mining techniques were not feasible. Instead, a levee or stop-bank was formed and the captive water was removed by pumping. When the dewatering was completed, the mine was attacked from the surface; a huge dragline first employed in spoil removal.

One of the major problems here was silt removal which was a time consuming proposition. In 1954 Downer and Co., Ltd., contractor handling the stripping job for the New Zealand Government Mines Department, added four TS-300 motor scrapers and a pair of HD-21 crawler tractors to help in the stripping work. The scrapers were employed to remove about a 20-ft layer of fine clay or sedimentary mudstone directly above the coal seam.

The mine is currently producing about one ton of coal per minute, necessitating, for practical reasons, removal of ten tons of overburden per minute. Because of this, Downer has built an imposing fleet of equipment to handle the needs of this job. Today ten Allis-Chalmers T360 tractors, with high-capacity rear dump wagons, a number of HD-21 crawler tractors and HD-6G and HD-9G tractor shovels are helping Downer keep pace on this assignment.

Interesting Contrast

An interesting contrast is revealed when old coal faces are exposed by today's modern machines. The walls, bearing marks of miners' picks, are floodlighted as scrapers open the old



HIGH-CAPACITY wagons are loaded with overburden by stripping shovel (above), and eject material in spoil area (below). Ratio is 10:1, ton for ton.



workings where no light has penetrated since the last miners' lamp flickered out nearly a half century ago.

The T360 tractors and their companion rear dump wagons make continuous treks from the mine site, loaded by power shovel, to the dumping pit where overburden is casted and wasted.

Coal is extracted by means of a %-yd shovel and conveyed by belt conveyors. An HD-6G, located in the vein, assists in the coal handling and muck removal to keep output tuned to about 500 tons per shift. It's a colorful spectacle . . . a unique one.

New Area Enclosed

About 2 yr ago, a further portion of the lake was enclosed by a 1¼ mi levee to surround an area containing 2¾ million tons of coal. This will extend the life of the mine up to another 25 yr.

After the stop-bank was installed, a cutter suction dredge, assembled on the shores of the lake, was floated into position within the confines of the man-made embankment. This was put into operation in May, 1958; the cutter-propeller churning into the soft clays and silt at the bottom of the lake and expelling these materials in suspension with water through a jointed-floating pipe. It will require about 5 yr to suck this enclosed body of water dry. This silt and soft clay removal will eliminate the problem of working these hard-to-handle materials when the area is dewatered. As was noted earlier, this was a material handling problem with the first attempt at opening the mine up from the surface.

Fantastic things continually pop-up in the construction world, and this is certainly one of them. Allis-Chalmers International distributor serving this job, is Cable-Price Corp. Ltd., Wellington, New Zealand.



GET TOUGH

WITH LUKENS"T-I"STEEL

Where the going gets rough, versatile Lukens "T-1" steel fights back. For repair or modification of heavy duty equipment such as truck beds, chutes, bucket teeth and dozer blades, this special duty steel plate can be ordered from warehouse stock in a wide range of plate sizes and gages. Lukens "T-1" is the modern mining steel—you can work and weld it in the field as readily as in your shop. Its terrific

resistance to abrasive impact—coupled with an extremely high yield strength—means fewer replacements and often greater payloads. That's why more and more equipment builders are using Lukens "T-1" to provide longer life in shovel buckets, trucks and other mining equipment. Remember to specify the extra-tough 321 min. BHN quality. For performance and application details, request our special booklet, "Lukens 'T-1' for Toughness." Address Manager, Application Engineering Dept., M40 Services Bldg., Lukens Steel Company, Coatesville, Pennsylvania.

You can order Lukens "T-1" steel plate from these Steel Service Centers:

Alabama, BIRMINGHAM 2, O'Neal Steel, Inc., P.O. Box 2623 • California, LOS ANGELES 54, Earle M. Jorgensen Co., P.O. Box 2358, Terminal Annex, 10650 S. Alameda St. • LOS ANGELES 33, The R. J. M. Company, 238-248 South Mission Rd. • Illinois, CHICAGO 8, Joseph T. Ryerson & Son, Inc., 16th and Rockwell Sts. • Kentucky, ASHLAND, Mansbach Steel Co., 19th St. and River Front • Maryland, BALTIMORE 2, Wm. G. Wetherall, Inc. 317 President St. • New Mexico, ALBUQUERQUE, Miller and Smith Mfg. Co., Inc., 500 Phoenix Ave., N. W. • Ohie, CLEVELAND 6, Mills-Wolf Steel Co., 12434 Cedar Rd. • Oregon, PORTLAND 4, J. E. Haseltine & Co., 115 S. W. Second Ave. • Pennsylvania, McKEES ROCKS, Follansbee Steel Co., 200 Bradley St. • Quebec, MONTREAL, Drummond, McCall & Co., Ltd. 930 Wellington St. • Utah, SALT LAKE CITY, Structural Steel & Forge Co., P. O. Box 300 • Washingten, SEATTLE 4, Stack Steel & Supply Co., 500 Landers St. • SPOKANE 10, Union Iron Works, East 217 Montgomery Ave., P. O. Box 2135.





For maximum efficiency

Here, the THRU-STEEL Dust Collector is mounted on a continuous miner. Roof bolt drills and dust collectors on both sides of the machine help keep roof bolting up to or ahead of the miner.

New M-S-A° Collector sucks dust through drill steel -speeds roof bolting, improves safety

The M-S-A® THRU-STEEL* Dust Collector helps keep roof bolting up to or ahead of the mining cycle.

With old style collectors, time wasting set-ups are necessary to raise the dust collecting head against the roof. Not so with THRU-STEEL Collector. Collector cup and jack assembly are eliminated. Dust is sucked into the tubular drill steel through narrow slots below the bit. and quickly conveyed through the drill steel to the collecting tank. Smooth round drill steel, used with this system, is easier to handle than scrolled augers. Steels can be added and withdrawn easier, faster, and more efficiently.

THRU-STEEL Collector assures

safe, proper dust control because bolt hole drilling and dust collecting operations are integrated. Cleaner, safer working conditions, with better visibility result. Drill steels are safer to handle. No scrolls to snag gloves, sleeves, or clothing.

The M-S-A® THRU-STEEL Dust Collector installs on any roof bolting machine or continuous miner equipped with roof drills. Various lengths of drill steel make it adaptable for high or low seams. If you have the M-S-A® Bolt-Hole Cleaner, it can be converted to a THRU-STEEL Collector easily, inexpensively. Call your MSA Representative for all the facts, or write us for bulletin.

This is the THRU-STEEL system. It consists of the bit, drill steel, chuck adaptor, rectan-gular or cylindrical collecting tank, vacuum pump, relief valve, and silencer.

USBM Approved



201 N. Braddock Ave., Pittsburgh 8, Pa.

MINE SAFETY APPLIANCES CO. OF CANADA, LIMITED Toronto, Calgary, Edmonton, Montreal, Sydney, N.S., Vancouver, Winnipeg

*Trademark

24 Maintenance Tips

MAINTENANCE PERSONNEL, normally, are so busy keeping up with day-to-day problems that little time is left to experiment and search for new ideas and materials that would help solve many of their problems. This is, by no means, their fault. They are the victims of "too much to do and not enough time to do it in." Information in

this section is tuned to the problems and interests of maintenance groups. The following is a selection of—maintenance tips that might possibly relieve maintenance personnel of some of the strain of every-day problems so that more time can be devoted to improving maintenance practices.



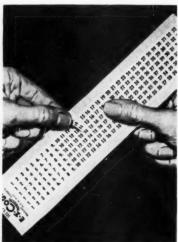
Automatic Retractable Hose and Cable Reels

Life of electric welding cables and oxygen-acetylene hose can be greatly increased by using automatic retractable hose and cable reels in shops. Advantages are:

- Keeps hose and cable stored in a safe place.
- Reduces time required to get started and also putting equipment away.
- 3. Protects hose and cable against cuts, bruises and burns.
- Makes cleaning up work areas easier.
- Prevents accidents caused by hose and cable being scattered on the floor.

Reels made for this purpose can be mounted on the floor, ceiling, wall or on mobile equipment.

Typical units shown in the accompanying illustration are manufactured by United Specialties, Inc., Box 698, El Dorado, Ark.



Identification Tags For Electrical Equipment

Proper identification of electrical components is made easy by the use of code markers which are self-adhering reports Westline Products, Div. of Western Lithograph Co., 600 E. Second St., Los Angeles 54, Calif.

Markers are available in a variety of colors, legends and sizes. Numbers, letters, electrical symbols, phase markers, NEMA colors (plain and numbered), and cycles and voltages are examples of the many types available.

The manufacturer states that the markers are a fast, inexpensive method of marking wires, cables and conduits.

Vinyl plastic wire markers are resistant to oils, scuffing and abrasions, thus providing positive identification. Their use simplifies wiring procedure and permits repairs to be made quickly and easily.

Preprinted sleeves which slip over wires also are available. These sleeves provide for a more permanent method of marking wires. Markings are printed on sleeves. They are available in many sizes and lengths.

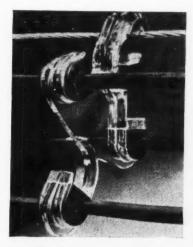


Steam Cleaners

The steam cleaner is probably one of the most useful tools in a shop. This is especially true when overhauling mine equipment is part of the maintenance program. If parts are thoroughly cleaned before they are disassembled the job of repairing is much easier, quicker and more accurate. Steam cleaners also can be of more benefit than just cleaning parts. They can be used to keep shop equipment clean and oil-free, thus making it safer to operate.

If a portable steam cleaner is available it can be used in preparation plants and other locations where equipment requires periodic cleaning, and overhauling.

Steam cleaners today are available in almost any type or size. If your shop is not equipped with one of these units it might pay to check on the advantages of owning one. Steam cleaner illustrated is product of Pantex Mfg. Corp., Pawtucket, R.I.



Cable-Spacer System

Spacers for aerial cables permits handling one cable at a time during quick installation of overhead system. Spacers are in one piece and are made of insulating material with high-strength, low-resistance aluminum messenger and neoprene grommets. They are made in a variety of aluminum phase-conductor constructions. Spacer shown is product of Kaiser Aluminum & Chemical Corp., 1924 Broadway, Oakland 12, Calif.

Motor Bath

A new liquid which will effectively clean oil, grease and other foreign contaminants from stator windings and all component parts of electric motor has been announced by Ranco Industrial Products Corp., 13311 Union Ave., Cleveland 20, Ohio.

The cleaning process is accomplished by submerging the entire motor in the liquid and allowing it to run under its own power. Motors which must remain in place can be sprayed. "Motor Bath", states the manufacturer, is a nontoxic, nonflammable and nonexplosive neutral liquid. It is completely harmless to motors and does not affect insulations, windings, varnishes, phenolics, laquers or enamels, and will not damage paint on motor housings.

Even after exhaustive tests and hard usage in practical applications the liquid, reportedly, has not reached the point at which it is no longer effective. It can be used over and over, making it extremely economical. It also can be filtered or distilled for still greater economy. Manufacturer's laboratory tests show what the new liquid—No. P261—will not reduce the megohm resistance of stator windings after complete immersion and cleaning.



Metal Cutter

Portable electric and pneumatic nibblers are reportedly capable of cutting stainless steel up to 10 gage, mild steel up to 8 gage and non-ferrous metal up to 3½6 in. They are manufactured by the Fenway Machine Co., 3107 N. Broad St., Philadelphia, Pa. The nibblers are said to cut with no distortion on either side of the material and leave a finished edge. The air-powered unit can be used in areas where a torch or electric tool are not permissible.

Motor Insulation

Motor insulations have improved markedly over the past few years. New materials are available in a variety of forms. With wise selection motor maintenance costs can be reduced. Insulation used for motors is generally composed of more than one basic material. In evaluating insulating material consider all factors before making selection.

A few of the newer insulations employ the encapsulation method either as solid winding enclosure or as continuous coil insulation. Silicones are finding use in Class B insulation.

Magnet-wire coating is still the toughest spot that insulation must fill. Polyvinyl is popular for most applications. Epoxies, polyesters and acrylics play an important role.

Cable-Fault Locators

Fault locators are instruments used for locating faults in electric power cables. These instruments consist essentially of high-voltage capacitor discharge transmitters and detectors. They are tracer-current devices in which high current at high voltage is used to break down the fault for external identification by means of a pickup coil and detector. In most cases when the energy pulse flashes across the fault there is a loud audible report which reveals its exact location.

Fault locators are made by a number of instrument manufacturers. Companies using large amounts of cable in the 600- to 7,200-V insulation class should investigate the possibilities of having one located on the job. Many hours of downtime can be eliminated through the use of these instruments in finding faults in power cables quickly.

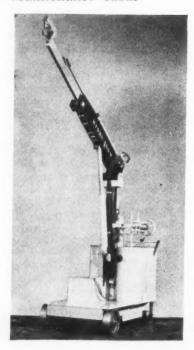
Liquid Sealant

A liquid sealant that does the job of hundreds of mechanical locking devices has been announced by the American Sealants Co., Hartford, Conn. The company claims that "Loctite Sealant" prevents breakdowns caused by loose bolts, nuts and studs; repairs loose bearings without expensive shaft or housing preparation; simplifies tube joining; and prevents leaks in high-pressure fluid lines. A single drop of the liquid will make any threaded part self-locking and vibration-proof.

Solderless Terminals, Connectors and Splices

Solderless terminals, connectors and splices have been greatly improved in recent years. An investigation into the different types now available could prove profitable in solving present wiring problems. Insulation qualities, dielectric strength; corrosion, oil and moisture resistance; and tensile strength have been proved in service. Speed of application reduces wiring time.

Special tools are used to fasten connectors to cables. They are available in various sizes for different wiring jobs. Many of the connectors are equipped with sleeve insulators.



Materials Handling

The manufacturer of a battery-powered "Hydro-Boom" crane with hydraulic action in three directions boasts that it will position loads up to 2,500 lb within ½00 of an inch. The unit is made by the Vanguard Engineering Co., 1908 E. 66 St., Cleveland 3, Ohio It is offered as ideal for shop use.

Multiple-Disk Brake

Recognizing that heat has always been the major brake problem, Auto Specialties & Mfg. Co. has developed a unit that gets rid of heat by a bath of cooling oil. The entire brake—a brake-retarder combination—is filled with transmission-type A cooling oil pumped through a heat exchanger, which in turn, gives up brake-generated heat to the cooling system.

Filled with oil, the Ausco brake is necessarily completely sealed against the elements, functioning uniformly under all weather conditions. No water, dust or foreign matter can enter to interfere with performance of the brake. A slight positive oil pressure is maintained to further guarantee against entrance of water, etc.

Brake lining service life, calculated after repeated tests in mountainous terrain, is claimed to be around 300,-

000 miles—more than seven times the average life of linings in present brakes.

A typical brake contains a "stack" consisting of six rotors and six stators. Rotors carry a total of 75 sq in in sintered metal lining each—a total of 450 sq in for each brake. The number of rotors and stators can be increased or decreased to provide capacity as required, with no changes in brake diameter.

Condensed from *Fleet Owner*, a McGraw-Hill publication.



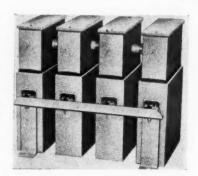
Portable Tester

A new tester for insulation breakdowns features an automatic "Squawker" that sounds at preset leakage current value. The operator of the Series 4003 Hypot Jr. need not take his attention off the point of test to watch for visual breakdown indication while moving test prods about the terminals of multiconductor cables. This unit is manufactured by Associated Research, Inc., 3777 W. Belmont Ave., Chicago 18, Ill.

Lubrication Equipment

Lubrication is probably one of the most pressing problems in a maintenance organization. Lubrication equipment today is designed not only to do a better job but also to speed up the lubricating cycle. Portable equipment is more versatile than it was a few years ago. Lubrication costs can be reduced by using the latest equipment. Manufacturers of this equipment can assist you in making the right selection. If it has been some time since you last checked with them it might be profitable to find out what is new in this field.

There are many possible solutions to lubrication problems.



Capacitors

Capacitors for low-voltage industrial applications are available for both single- and 3-phase installations. They are furnished in 480- and 600-V units and are of the Type PF standard and PFD dustproof series. Made by Sprague Electric Co., 315 Marshall St., North Adams, Mass., these units are impregnated with clorinol, a non-flammable askarel synthetic liquid dielectric to permit operation over a temperature range from -40 to +46C.

Multiarc Welding

New developments in multiarc welding — using a single unit to supply power to as many as 30 operators—make it worth while to compare this method with single-operator welding for many field and shop jobs, notes J. B. Nottingham & Co., Inc., 441 Lexington Ave., New York 17, N. Y. One power unit for many operators, instead of one for each operator, means big savings in equipment costs. Multiarc welding offers many other advantages, including high-quality welds under a wide variety of conditions.

Rugged, compact power units, reports the manufacturer, are designed around the new silicon rectifiers. Other equipment engineered specifically for multiarc welding, plus the inherent advantages of the system, make it preferable for many uses.

Small Parts Storage

Good housekeeping practices lead to efficient shop operation. And efficiency means more production, more profit and lower costs. This is particularly true in an electric-motor repair shop where many replacement parts and accessories must be stored in a readily identifiable and accessible manner. Unless this is done, valuable time can be lost and considerable frustration experienced in searching for a specific part. The smaller the item, the more elusive it can be when needed.

Much of this can be, and has been, eliminated in many shops by using variations of the glass-jar storage method. Capped jars with parts identification labels rest on or are suspended from shelves and racks. Biggest advantage is quick visual identification and comparison of the old with the new.

Condensed from *Electrical Construction and Maintenance*, a McGraw-Hill publication.

New Motor Design

A synchronous motor with a unique magnetic structure is claimed to offer several significant advantages over conventional machines. Reliability, long service life, low maintenance requirements and ability to operate at high speeds are features of the SECSYN (stationary-exciter-coil synchronous) design of the motor.

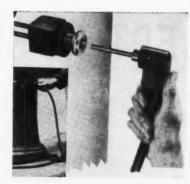
The rotor of the machine is essentially a tube supported by a "spider of spokes" on the rotor shaft. The spokes, extending from the shaft to the north poles, are of magnetic material. North poles appear as hexagonal areas on the rotor surface.

The north poles are surrounded by nonmagnetic, but electrically conducting, material which forms the damper cage. Remainder of the central portion of the rotor tube (equivalent to the width of the north poles) forms end of the rotor tube provide a path the south pole. Outer rings at each for the return of flux to stationary field coils via homopolar air gaps.

The rotating pole structure is excited by stationary coils. These coils are located within the hollow of the rotor under the outer rings at both ends. They do not rotate, being fixed relative to the stator.

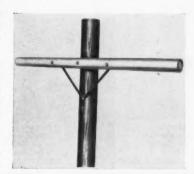
With this structure, the Bekey-Robinson patented SECSYN combines the advantages of brushless construction with the weight and size advantages of conventional statically-excited machines. Reliability is promoted by the absence of brushes, rotating rectifiers, rotating copper field windings or coolant seals in the rotor.

From *Electrical World*, a McGraw-Hill publication.



Keyed Plugs

Keyed plugs and receptacles permit repairman to remove power from lines to be serviced and prevent tapping by unauthorized persons. The receptacles can be mounted on panel-boards. Circuit is energized by inserting and turning the mating key-plug, unit. J. B. Nottingham & Co., Inc., 441 Lexington Ave., New York 17, N. Y.



Fiberglass Crossarms

Development of fiberglass crossarms for utility lines has been announced by Gar Wood Industries, Inc., Ypsilanti, Mich. The cross arms provide exceptional electrical properties, lightweight and high resistance to weathering and insect damage, the company states.

Plastic Panes and Panels

Upkeep of shops and other building around the mines can be reduced by using new plastic panes and panels. Plastic panes are now available to replace most standard-size glass panes. Plastic panels can be used to replace complete windows or to add more light to building interiors by replacing sections of wall or ceiling space to get the desired light.

These new products can reduce

general upkeep and lighting costs in four ways:

- 1. Eliminating window breakage.
- 2. Providing free natural lighting.
- Cutting installation and maintenance costs.
- First costs are usually last costs since panes and panels are shatterproof and are not easily broken.

Inspecting by Camera

The Polaroid camera can be a valuable asset to maintenance departments. Photographs, which can be developed within 1 min, will show in more detail what condition equipment, for example, is in. If maintenance supervisors were equipped with cameras they could take pictures during inspection tours of conditions that require corrective measures. The pictures then could be turned over to the men responsible for making corrections. It would eliminate much of the present buckpassing and open the door for better maintenance efforts on the part of repairmen.

Solving Storage and Maintenance Problems

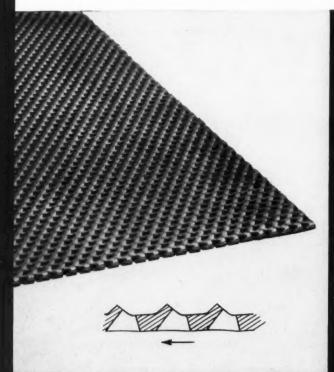
Ready-made galvanized steel angles with accurately spaced slots and holes designed for easy assembly are available from a number of manufacturers. These angles can be used to solve many storage and maintenance problems. Practically any type of structure including racks to store all types of material, guard rails, ladders, tables and work benches, pipe and conduit hangers, scaffolds with stairs and many others, can be made with these angles. Speed in assembling, economy, strength and durability are among the advantages.

Safety Paints

A new safety color concept in paints is now on the market. They are four times brighter than ordinary paints. Their application in and around the mines could make hazards and equipment more visible to workers, thus increasing safety. Because of poor visibility and the large number of hazards present in mining, these paints could easily reduce the number of accidents resulting from poor visibility.

from NATIONAL-STANDARD

NEW CONCEPT IN SCREENING



CONIDURE* sheets are available in a complete range of hole sizes and rolled surfaces. The working side of Conidure sheets has shovel-like humps that guide material into the narrow openings, increasing screening action. The extreme taper of the hole prevents clogging or blinding.



RIMA* screens can be supplied as rectangular, oblique angled, round or oval beds. The complete range of slit widths and wire profiles accommodates a wide variety of screening and filtering operations.

New CONIDURE Screens

New Conidure sheets are produced by a unique process of piercing trapezoidal-shaped holes, highly tapered in the screening direction. Sheet thickness can be several times greater than hole diameter for higher capacity and longer wearing life in coal, sugar and chemical centrifuges or on vibrators, separators and screening machines.

*®by Hein, Lehmann & Co., Dusseldorf, Germany

New RIMA Screens

New Rima shaped-wire screens for coal, paper and food processing and water or sewage filtration have special capacity advantages over standard wedge-wire screens because of high-narrow profile wires that provide larger open area. The unique cross bar and spacing lugs keep wires uniformly separated for greater efficiency in screening.

FOR COMPLETE INFORMATION on New Conidure and Rima Screens, write for new illustrated catalog to NATIONAL-STANDARD COMPANY, NILES, MICHIGAN



COMPANY



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(TRUCK LIFE, THAT IS)



ASK YOUR DEALER ABOUT EATON 2-SPEED AXLES

Your truck dealer will tell you how Eaton 2-Speed Axles can extend the life of your trucks by thousands of trouble-free, low-cost miles.

By reducing engine rpm in relation to vehicle speeds, Eaton 2-Speed Axles hold down wear on engines and all power transmitting units. They add to miles travelled and number of loads carried between engine overhauls; they reduce maintenance costs; keep trucks on the road, out of the shop. Your dealer will also tell you that trucks equipped with Eaton 2-Speed Axles bring higher allowances when traded in.

Get the facts—then specify Eaton 2-Speed Axles on the next trucks you buy; they will pay for themselves many times over.



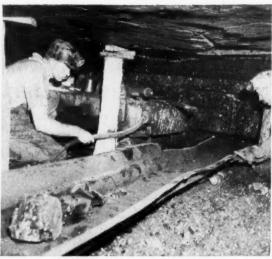


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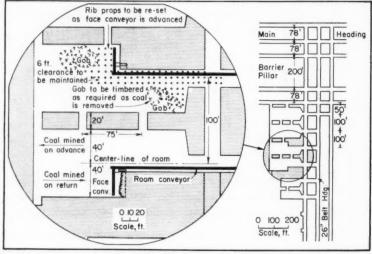
MANUFACTURING COMPANY
CLEVELAND 10, OHIO



CLOSE TIMBERING on 3-ft centers is the minimum standard required by weak roof covering 32-in seam at Laddie mine.



TEAMWORK among crew in smoothly running face cycle is important in successful thin-seam mining with conveyors.



MINING PLAN calls for rooms 40-ft wide on 100-ft centers and 40-ft face on pillar retreat.



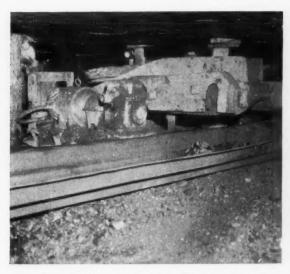
Thin-Seam

Crew teamwork and strict adherence to roof support standards are keys to successful conveyor mining in 32-in coal.

BAD ROOF that requires posts on 3-ft centers and 32-in coal are two tough conditions facing management every day at the Laddie Coal & Mining Co., Robbins, Tenn. Offsetting these disadvantages to some extent and making successful mining possible is the unusually high quality of the coal—3 to 4% ash, 0.73% sulphur and 14,536 Btu. Because of the bad roof and the limited working space, Laddie employs handloading at the face and chain and belt-conveyor haulage. One of the major problems is a weak roof.

Because of its exceptionally high quality and burning characteristics, Laddie coal enjoys a favored position in the domestic and stoker coal markets. To take advantage of the market opportunities the company's goal is to produce a maximum of the larger sizes and a minimum of ¼x0. Close supervision of shooting practices helps

TAKING TOP ROCK is part of regular work for crew in main heading.



FACE CONVEYOR, extending 40 ft across room, feeds onto shaker. Unit is pulled ahead after each cut is loaded.



BUSY SCENE in main heading includes belt with two convevors feeding it, and a combination rock and coal shaker.

Conveyor Mining Under Weak Roof

company management to reach this goal.

The Laddie property originally was opened by the federal government during World War II to supply coal for the atomic energy program at Oak Ridge. After the war ended the property was put up for sale at public auction and was operated by private owners for several years. However, it was later reclaimed by the federal government and put up for resale in 1952. It was at this time that the Laddie owners bought the property. For the next several years it remained idle. But in the spring of 1955 the company began developing the present mine.

Starting on a modest scale with all-belt haulage, the company gradually increased production to 800 tpd in two-shift operation. In response to an increasing demand for its product, Laddie is now expanding capacity to 1,000 tpd.

Mining Conditions

Laddie mines the Glen Mary seam which outcrops at an elevation 1,200 ft above sea level. Seam thickness varies between 30 and 36 in and averages 32 in. There are no bands of impurities in the coal, which is comparatively hard and breaks well for easy loading. A typical analysis of the coal is as follows:

Ash 3 to 4%
Sulphur 0.73%
Volatile matter 35.5 to 36.5%
Fixed carbon 56.4%
Btu, Dry 14,536
Ash-softening temp 2,770F
Free-swelling index 4 to 5

The weak immediate roof, which requires close support, is common throughout the mine and varies in thickness from a feather edge to 18 in. In some areas the roof requires support by either 2x6x24-in headers in conjunction with straight posts or 3x6-in crossbars.

Developing Entries

Laddie develops its main entry with seven headings in a two-stage method. The first step includes driving the three middle headings 600 ft with Goodman shaker conveyors. A three-man crew works in each heading. In the second stage, two headings are added on each side of the middle headings are added on each side of the middle headings are added on each side of the middle headings as room panels are developed.

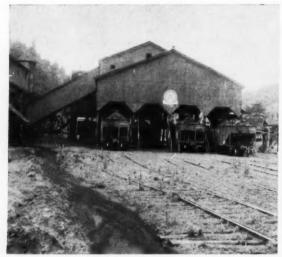
Starting at a new setup, the three crews advance each of the three middle headings 75 ft. Then the crews in the two outside headings add a 90-deg swivel and cut a breakthrough to the center heading. While these crews cut

the new breakthrough, the crew in the center heading drops back 75 ft to the last breakthrough and takes top rock with a duckbill.

By the time the two breakthroughs are completed the rock crew has reached the new breakthrough and is ready to start loading coal again. The three crews repeat this procedure until they have advanced the headings 300 ft. Then they move the equipment up to the last breakthrough and reset to drive another 300 ft.

After driving the three center headings 600 ft, the crews set up the conveyor to drive a three-heading room panel to the left or right. As soon as the room panel advances beyond the barrier pillar a Jeffrey 52B belt conveyor is installed in the middle panel heading. Then two more shakers are brought in to drive two main headings back to meet two headings advanced 300 ft from the previous panel entry. When these two main headings cut through, five of the main headings are connected to the new panel. The remaining two main headings are connected similarly when a new room panel is developed from the opposite side of the main heading.

After the crews connect the two main headings the two conveyors are set up on the outby side of the panel entry at the barrier pillar to start driving two rooms. Two more conveyors



FIVE-TRACK PLANT is designed so that five sizes of highquality domestic coal may be loaded simultaneously. A 50-ton hillside surge bin feeds the plant.



UNDERGROUND supervisors include J. R. Sexton Jr. (left), Edd Roberts, mine foreman, J. E. Brown and W. M. Owens, assistant mine foremen.

are added as they complete the last rooms in another panel. The company finds that they get best results when not more than four shakers are used in rooms in a panel.

Driving the Rooms

Rooms, on 100-ft centers, are driven 20 ft wide for the first 20 ft and then widened to 40 ft. As the crew widens the face they set and extend a Jeffrey HG face conveyor along the face. This unit carries coal to the shaker, which is installed 10 ft from the rib. After rooms reach a depth of 210 ft, the crew cuts a breakthrough to the next room and then resets the face conveyor for pillar work. Approximately 40 ft of each room pillar is recovered on retreat, leaving only 20-ft-wide blocks between rooms.

Each room crew cuts, shoots and loads 100 to 120 ft of face per shift. In each step of the face cycle the men are required to set straight posts on 3-ft centers and as many more headers or crossbars as necessary to make the place safe.

Each room crew is made up of five men who share the face duties. A typical face cycle in a room, beginning with completion of the cut to the left rib, is as follows:

- 1. Move machine to right rib and cut 20 ft of face (sump cut).
 - 2. Pull up drive of face conveyor.
 - 3. Shoot remainder of cut face



SUPERINTENDENT C. J. King directs operations at Laddie mine.

from edge of previous sump cut to rib.

- 4. Load the broken coal. Set timbers as quickly as possible.
- 5. Shoot and load the 20-ft sump cut.
- Cut across the remainder of the face.
 - 7. Repeat cycle.

It takes six or seven holes charged with 3 or 4 sticks of du Pont Lump Coal CC to break each cut of coal. Holes are drilled 10 to 12 in from the roof with a Chicago Pneumatic 572 handheld unit equipped with Kennametal augers and bits.

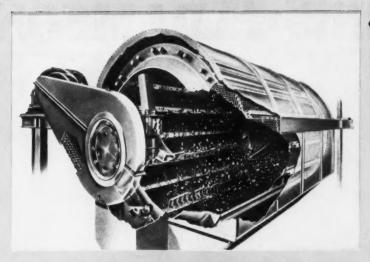
Transporting the Coal

Room conveyors discharge onto a Jeffrey 26-in panel belt driven by a 20-hp 275-V DC motor. Laddie has two of these units in service and has a third one on hand to make new setups at a new panel as needed. Panel belts operate at two speeds: 250 fpm for hauling coal, and 185 fpm for transporting men or materials.

The main haulage system includes a Jeffrey 52B belt that extends from outside the mine to a point 1,750 ft inside the main entry; a 1,600-ft Hewitt-Robins unit; and a 900-ft Jeffrey unit that is extended as the mains are advanced.

As the coal leaves the mine it passes over a short section of conveyor equipped with a TransWeigh electronic scale. A permanent magnet suspended over the end of the belt removes tramp iron before the coal flows to a 50-ton bin feeding the tipple. Conveyors are equipped with Scandura Gold Line and Republic belt joined with Flexco and Hayden belt splices.

Coal flows from the storage bin to the tipple where it is crushed and sized into five grades. The Laddie plant is designed so that all the following sizes may be loaded at the same time: 6-in block, 4x6 egg, 1x4 nut, 2x4, 1x¼ stoker and ¼x0 carbon. In the heating season all sizes but ¼x0 are sold as domestic fuel. In warm weather the company sells its products to industrial consumers.



PENNSYLVANIA BRADFORD BREAKERS prepare over 160 million tons of coal each year

Because no other coal processing machine does so much for so little—Pennsylvania Bradford Breakers have become a standard of the industry.

At power plants, by-product coke plants, coal mines and coal cleaning plants Pennsylvania Bradfords clean, size and scavenge at phenomenal low cost.

Data from 10 installations over 8 years shows an average maintenance cost of \$.001 per ton, and an average power consumption of .204 KW per ton.

TRIPLE ACTION

Continuously charged, the Pennsylvania Bradford immediately

screens out passing sizes of coal through the screen plates. Larger lumps are raised and dropped, breaking by gravity impact until they are screened. All refuse—sulphur balls, slate, rock, tramp iron, etc.—resist breakage and travel the full length of the breaker where they are discharged.

BRADFORD-HAMMERMILLS

For reduction of particularly hard coals and for heavier loading, Bradford-Hammermills are frequently specified. This machine combines a concentrically-mounted rotor of a hard-hitting Pennsylvania Hammermill at the rear end of the slow speed Bradford Breaker. Capacities are increased over 20%.

Pennsylvania Bradford crushes, sizes, scavenges all in one operation—at lowest cost

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For the full story on Pennsylvania Bradford Breakers and Bradford-Hammermills write for Bulletin 3007.

RING-TYPE Granulators

For preparing coals for stoker and pulverizer fuel, and other uses where overgrinding is undesirable, Pennsylvania Ring-type Granulators have no peer. Exclusive design; exclusive advantages. Completely described in Bulletin 9002. Send for it.



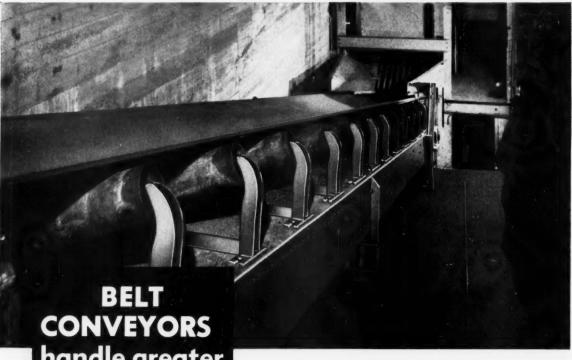
PENNSYLVANIA CRUSHER DIVISION BATH IRON WORKS CORPORATION

WEST CHESTER, PENNA.

Over 50 years concentrated experience in all types of material reduction makes Pennsylvania your best source of crushers and engineering advice and service. Call on Pennsylvania with your next crushing problem. Representatives from coast-to-coast.



STEPHENS-ADAMSON



handle greater coal tonnage at lower cost per ton

Speed, efficiency and lower cost*per ton in handling raw coal are prime factors of evaluation when considering a belt conveyor system. Feature for feature, STEPHENS-ADAMSON belt conveyors meet and surpass these major requirements. Enviable records of greater tonnages handled at a lower cost per ton are turned in daily by countless S-A belt conveyor systems now in operation all over the world. Write today for full details on S-A Engineered Conveyor Products for coal handling.

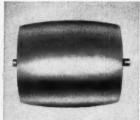
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WRITE FOR BULLETIN 355



S-A CATENARY CARRIERS --BULLETIN 260



S-A CURVE-CROWN PULLEYS — BULLETIN 558



S-A HOLDBACKS BULLETIN 557



ENGINEERING DIVISION
STEPHENS-ADAMSON MFG. CO.

GENERAL OFFICE & MAIN PLANT, 55 RIDGEWAY AVENUE, AURORA, ILLINOIS

PLANTS LOCATED IN: LOS ANGELES, CALIFORNIA • CLARKSDALE, MISSISSIPPI
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keep driving longer for lowest cost-per-mile

It takes just one "down" unit to wreck schedules, eat up narrow profit margins. That's why more and more contractors count on the Nygen-built General Tire to keep units rolling whatever the going. Engineered for maximum traction and minimum rolling resistance, Generals take mud, sand, rock and grades in stride... help hold costs down to keep profits up. Prove it to yourself on your next big job.

THE GENERAL TIRE & RUBBER CO. Akron, O.

AMC 1960 Coal Convention Program

Monday, 10:00 AM, May 9

National Fuels Policy

Hon. Wayne N. Aspinall, U. S. Representative from Colorado; Chairman, House Committee on Interior and In-

Hon. Frank E. Moss, U. S. Senator from

Hon. John P. Saylor, U. S. Representative from Pennsylvania

Monday, 2:15 PM, May 9

Thin Seam Mining

Conventional Mining in Thin Seams E. W. Potter, Royalty Smokeless Coal Co.

Continuous Mining in Thin Seams K. S. Hobbs, Eastern Gas & Fuel Associates

Equipment Needs and Trends for Thin-Seam Mining
Neil Robinson, Robinson & Robinson, Charleston, W. Va.

Research in Hydraulic Coal Mining Joseph J. Wallace, U. S. Bureau of Mines

Monday, 2:15 PM, May 9

Strip Mining

Recent Developments in Blasting Overburden

(a) With Ammonium Nitrate Dr. George B. Clark, Missouri School of Mines

Explosives

(b) Moving Overburden with August Manifest, Marco Coal Co.

A New Approach to Drilling Overburden Representative of Hanna Coal Co.

The Electric Wheel Drive

E. R. Borcherdt, Consulting Engineer, San Francisco, Calif. Discussion by McGlade, Letourneau-Westinghouse Co., and J. L. Vint, Unit Rig & Equipment Co.

Tuesday, 9:30 AM, May 10

Safety

Progress in Roof Control-Panel Discussion

(a) Roof Cementation D. F. Crickmer, Pocahontas Land Co. (b) Sonar Exploration of Roof Rocks

Dr. Charles E. Mongan Jr., Consulting Engineer, Cambridge, Mass.; and Thomas C. Miller, U. S. Bureau of Mines

(c) A Practical Look . V. Gibson, New River & Poca-hontas Consolidated Coal Co.

Progress in Ventilating Continuous Mining Sections

C. H. Patterson, Rochester & Pitts-burgh Coal Co. Discussion by John B. Kebblish, Mountaineer Coal Co.

Fire Fighting Experiences W. K. Dennison, Kaiser Steel Corp. Tuesday, 9:30 AM, May 10

Coal Preparation

Some Economic Aspects of Coal Preparation Frank Zachar, Consulting Engineer,

Morgantown, W. Va.

Progress in Preparation Plant Automation R. E. Joslin, Clinchfield Coal Corp.

Preparation Plant Maintenance D. G. Werner, Pittsburgh Coal Co.

What's New in Anthracite Preparation J. E. Ippoliti, Wilmot Engineering Co.

Tuesday, 2:15 PM, May 10

Strip Mining

Aerial Photography and Mapping George Hess, Aero Service Corp.

Land Reclamation

Dr. Walter H. Schoewe, University of Kansas. Discussion by Charles Breeding, Ohio Reclamation Asso-

Maintenance of Strip Mining Equipment

(a) Wire Rope A. F. Meger, John A. Roebling's Sons

(b) Mobile Equipment R. M. Leseny, Truax-Traer Coal Co.

Earthmoving Equipment as a Sup-plemental Tool to Stripping Shovels C. J. Cooper, University of Pittsburgh

Tuesday, 2:15 PM, May 10

Underground Haulage

New Developments in Mine Haulage (a) Belts

Harry W. Meador, Jr., Stonega Coke and Coal Co.

(b) Rail William Coghill, Republic Steel Corp.

A New Development in Shuttle Car Haulage John S. Todhunter, Barnes & Tucker

Conversion of Existing Manual Hoists to Automatic Operation Hollis Pierce, Old Ben Coal Corp.

Haulage System Maintenance

(a) Belts Buddie R. Morris, West Kentucky Coal Co.

(b) Track S. Schrecengost, Allegheny River Mining Co.

Wednesday, All Day, May 11

Tax Forum

Discussion of current tax problems of the coal industry-for ac-countants and others handling tax matters, and all interested mining men.

Wednesday, 9:30 AM, May 11

Management and Cost Controls

People Dean James L. Hayes, Duquesne University

Personnel Selection-Panel

Dr. Quin Curtis, West Virginia University

C. G. Evans, North American Coal Corp.

John N. Crichton, Johnstown Coal & Coke Co.

Use of Electronic Computers in Coal Mining (Two Papers)
R. D. C. Morris, U.S. Steel Corp. W. L. Zeller, U.S. Steel Corp.

Wednesday, 9:30 AM, May 11

Underground Power

Design of a Power System for a New Mine F. G. Hamner, Southern Services, Inc.

Silicon Rectifiers
Ralph E. Wahl, General Electric Co. Discussion by C. L. Sarff, Hanna Coal Co.

Experience With AC Mining Otis G. Stewart, Union Carbide Metals

Maintenance of Mine Power Systems A. E. Molinski, Bethlehem Mines Corp.

Extending Trailing Cable Life Representatives of AMC Committee on Underground Power

Wednesday, 2:00 PM, May 11

Coal Preparation

Fine Coal Cleaning-1/4xO

(a) With Heavy Medium Cyclones

Representative of Heyl & Patterson,

(b) With Feldspar Jigs R. K. Bogert Jr., Badger Coal Co.

(c) With Tables
C. W. Porterfield, Pocahontas Fuel

Fine Coal Drying
Paul Levin, Allen & Garcia Co.

Wednesday, 2:00 PM, May 11

Thick Seam Mining

Conventional Versus Continuous Mining Equipment in Seams 38 to 48 Inches Thick
Harry Laviers Jr., South-East Coal

Co., Inc.

Conventional Versus Continuous Mining Equipment in Seams Over 48 Inches Thick W. F. Diamond, Island Creek Coal

Equipment Needs and Trends for Mining in Seams Over 48 Inches

E. H. Greenwald, Eavenson, Auchmuty & Greenwald

Productivity of Continuous and Conventional Mining Equipment
R. L. Anderson, U.S. Bureau of Mines

Wednesday, 2:00 PM, May 11

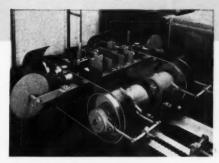
Stream Pollution— Panel Discussion

Ernst P. Hall, Consolidation Coal Co. Henry F. Hebley, Consultant, Pittsburgh, Pa.

L. E. Sawyer, Mid-West Coal Producers Institute, Terre Haute, Ind.

Supreme in mining service

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Impartial tests for edge-wear show Scandura far ahead in endurance.

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Scandura PVC Mine Belting surpasses every standard heretofore accepted for mine conveyor belts-in the laboratory, in the mine, and in point-by-point comparison with other materials. Safe Scandura PVC (Fire Resistant U.S.B.M. 28-1) is stronger because of unique, solid-woven nylon carcass construction-lighter, more flexible, amazingly long-lived with its exclusive PVC impregnation and surface cushions. Find for yourself how superbly Scandura resists wear, mechanical damage, moisture and abuse -install a length in your present system, and compare!

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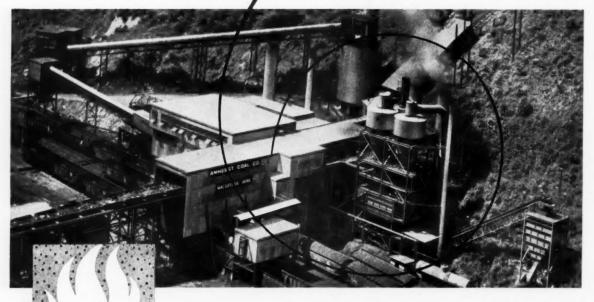
Pittsburgh 19, Pa.

AMHERST COAL COMPANY



"The MacGregor installation of your Flash dryers has increased the As Received BTU, the market realization, and the marketability of our carbon and related grades of coal by enabling us to sell a considerable tonnage of fine-sized coal formerly unmarketable because of its high moisture content."

N. W. Byers, Preparation Manager



RAYMOND Flash Drying

C-E Raymond Flash Drying Units provide a clean and safe automatic system without coal degradation. For small and large plants. High thermal efficiency—low maintenance cost. You, too, can increase your realization and the marketability of your coal with Flash Dryers by Raymond.

By reducing the surface moisture of your coal, you pack more BTU's in every pound. This means money to you—it is just that simple.

Our most recent installations at Amherst's MacGregor Preparation Plant at Slagle, W. Va., is just one of the many coal operations that are profiting by the use of Raymond Flash Dryers.

WRITE FOR COAL DRYING BULLETIN

COMBUSTION ENGINEERING, INC. 1120 West Blackhawk St. Chicago 22, Illinois Sales Offices in Principal Cities Principal Cities

Combustion Engineering-Superheater Ltd., Montreal, Canada

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CONSISTENT PERFORMANCE...

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Job-proven to give you more . . . in production, performance and service! In "show-down" tests in mine after mine, Cardox bits maintain a lower "cost-per-foot cut or drilled" rating than any other. It's no secret why . Cardox carbides are job-matched to meet your specific mining requirements, whether it be drilling or cutting. They are made to uniform quality standards . . . bit after bit, they deliver the same consistently high production output, the same long service life. They make continuous mining more continuous. Want proof? We'll be glad to run a test at your mine. You name the time, place and conditions. Bits available in all sizes and styles.

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heat-treated alloy steel

The all-new Cardox roof auger gives you 2-to-1 peformance over all others. Strong, rugged, long-lasting . . Cardox roof augers are constructed of tough alloy steel, welded-then heat-treated for added strength and abrasion resistance. An extra pitch of flight at the shanks end provides added strength at the point of stress. In standard lengths from 10" on up; other Cardox augers are available from 11/4" to 48" in diameter. Same high quality, same high performance.

immediate - service

lasting satisfaction You can rely on Airdox Cardox for straight practical answers. to your mining problems. We offer you a unique combination of experience, knowhow, broadest distribution and stocking facilities, and available qualified underground personnel to answer your needs efficiently, effectively and economically. Call on us coal, there's AIRDOX

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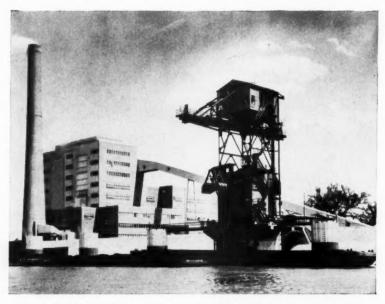
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Foremen's Forum



BIG-TIME CUSTOMERS want consistent quality in the raw materials they buy. They have a perfect right to shop around until they find it—in your coal or elsewhere.

The Customer Rules King Coal

Three Axioms:

- 1 Customers are free to shop around.
- 2 Consistently high quality keeps them happy.
- 3 Supervisors can help to insure high quality.

CONSIDER THIS SITUATION. A power company buys 1,000,000 tons of coal per year at a mine price of \$4.80 per ton. The specified ash content is to be 7% over the term of the contract. Now suppose that the average ash edges up to 8%. In a year's time this drop in quality would represent a loss of approximately \$48,000 in fuel value to the customer, to say nothing of the costs of hauling this added ash to his plant and handling it after combustion.

Obviously, this power company's coal buyer could not possibly tolerate a situation like this. He would long since have received satisfactory adjustments from the coal producer—had he not taken his business elsewhere.

This may be an extreme example, but it does illustrate the great importance of maintaining quality of product in coal production as in all other industries serving consumers who have a freedom of choice. Coal men face not only competition from other fuels but also aggressive competition from all other coal producers.

Furthermore, your customers buy more than coal; they buy a long list of supplies and raw materials. They can't spend too much time arguing about the quality of any one of them. You must provide consistent quality or they are perfectly justified in looking to other sources of supply.

Consider the example afforded by a relatively large paper mill. The recipe for a batch of paper that will provide a day's work at such a mill is as follows:

1,500 cords of selected logs

50 million gal of pure water

110 tons of salt

70 tons of other chemicals, and

70 tons of lime

21 million lb of steam from the burning of approximately 18 railroad cars full of coal.

You can see that the buyers and supervisors of an operation like this have a number of raw materials to think about. The purity or quality of each one is extremely important, and each must meet the specifications consistently.

Getting the coal from the face to the surface is not the end of the line, nor is running the coal through the cleaning plant and into the car. Day after day it must be sold. It is this step in the process that keeps your company in business. Your coal must be deposited into

SPECIAL REPORT TO CATERPILLAR OWNERS:



OPTIONAL TRACK GROUPS

up-date D9 or D8 Tractors for longer undercarriage wear

Now, two types of track groups are available for older model D9 and D8 Tractors . . . regular and optional, allowing you to tailor your undercarriage parts to meet job conditions.

Lighter tones at top of etched cutaways show depth of special hardness in wear zones.



REGULAR track parts are made from durable steel. They're heavy-duty, long-lived, special-hardened to resist wear.

OPTIONAL track parts are equivalent to those used on current production model tractors. The links and shoes are made from Caterpillar's new alloy steel that is hardened much deeper than regular steel. Link rails are hardened twice as deep. Shoe grousers are hardened 400% deeper. The new alloy steel also provides greater strength with more impact resistance.

MORE METAL WHERE IT COUNTS. Optional components are king size. Every part is

beefed up and made bigger with more hardened steel in wear areas.



BORALLOY "HUNTING TOOTH" SPROCKETS are another new feature of the optional groups. Every other tooth is used in one revolution, alternate teeth being picked up the next revolution. This alternation means that teeth contact the bushings only half as many times as do regular sprocket teeth. More important are the teeth themselves—they're machined for exact fit with the big bushings. This greatly extends bushing life.

COMPARE regular and optional track components:

Pitch	Pins O.D.	Bushings O.D.	Track shoe bolts and nuts	Sprocket
p8 regular 8 inches optional 9 inches	1 3/4 inches	2 3/4 inches	3/4 inch	14 tooth
	2 inches	3 inches	7/8 inch	25 tooth
pe { regular 9 inches optional 10 1/4 inches	2 inches	3 3/16 inches	7/8 inch	28 tooth
	2 1/4 inches	3 3/8 inches	1 inch	25 tooth

HOW MUCH MORE LIFE? Variation in the length of track life occurs because components have different wear rates under various soil and job conditions. In sand, pins and bushings wear faster. In rock, shoes and links wear faster.

ON-THE-JOB TESTS confirm that the new optional track components are giving up to 40% more life than the regular parts. On many applications, you can expect even greater wear life.

CORRECT TRACK GROUP SELECTION IS IMPORTANT. It depends on job types and conditions. Let your Caterpillar Dealer analyze your track needs. He'll recommend the correct components to help you get maximum life at the most reasonable investment. Call him soon.

SERVICE TIP:

FREE! Handy reference for ordering track options. "New Options for D9 and D8 Tractors" includes part numbers that are used to adapt to your older models. Pick up a copy at your Caterpillar Dealer's.

CATERPILLAR

Caterpillar Tractor Co., General Offices
Peoria, Ill., U.S.A.

somebody's bin or storage pile in return for money. The sales function is vitally important in this scheme of things. The best way for foremen to assist the sales function is to provide a quality product for the market.

Here are some suggestions for mine and cleaning-plant supervisors.

In the first place, the price of your coal must be maintained at a level that will make it competitive with other coals of similar characteristics and that will provide a profit. This requires constant emphasis at all levels of management and supervision on cost control, industrial engineering and methods research and improvement. This kind of cost control is a constant state of mind in highly efficient companies; it is not conducted in sporadic campaigns. We think the supervisor's primary mission is to help preserve this competitive price. This includes bearing down on safety, of course, to reduce the costs of accidents.

Good face preparation also is vital. Even in full-seam mining there may be only one suitable horizon in which the cut should be made. Be sure the cut is where it should be if this is the case. If cuttings are to be loaded out before the coal is shot, be sure to get the last pound of cuttings out of the way. To do otherwise is to place an added load on the cleaning plant, which may result in higher cleaning costs or customers' complaints.

If you use sprays for allaying dust, find out how much water you can apply before you foul up the moisture specifications. Keep spray nozzles in good condition to get best results with least water.

We have seen a number of bosses who never pass up an opportunity to remove trash from the stream of coal. It is a good habit to form, for while it may not materially ease the load on the cleaning plant, it does show the boss' concern for the quality of the product. It's a form of teaching by example, since others will adopt the habit.

Supervisors can also teach the operators of continuous-mining machines to keep cutting heads out of the roof and bottom. They can make certain effective cleanup is accomplished as the operations advance, realizing that development costs will be minimized as total recovery goes up.

Supervisors of preparation plants exert an even greater influence in turning out a product of consistent quality. The basic tools are available; the next requirement is to use, supervise and maintain them. Modern primary washers are designed to handle wide variations in feed volume and refuse content with no adverse effect on the product. Auxiliary

scavenging units, fine-coal cleaners, solids-reclamation equipment have been developed to the point of high efficiency in getting maximum yield from the raw coal. And a further assist is provided by automatic process controls, including nucleonic density controls and others.

New developments in quality-control techniques also help. It is possible now to make rapid determinations of moisture, ash and sulfur in clean coal and to have the results in hand before the railroad cars leave the property. It is required of preparation supervisors that they keep abreast of these developments, know how to use them, then use them.

The results of efforts like these, by mining and preparation supervisors, will result in low-cost production, competitive pricing and consistent quality. This is the best ammunition your sales force can have. The customer rules King Coal, but you will be able to please this demanding monarch.

Who Are Coal's Customers?

JUST ABOUT EVERYBODY . . . as related in the following excerpts from a brochure recently published by Peabody Coal Co.

"The light you read by, the meals you enjoy, your freshly laundered clothing, your air conditioning in summer and heat in winter—these are just a few of the personal comforts brought to you by coal-generated electricity. . . . Television, radio, home movies, hi-fi and stereo—all these are made possible by coal. . . . It is estimated that 25% of America's homes will be electrically-heated by 1975. . . .

"Coal's many applications in the manufacture of basic metals and hundreds of by-products are extremely important... Your automobile, lawn furniture, power tools—everything you use that's made of steel—owes part of its existence to coal. You can thank coal for the aluminum products you use, too; it takes 6.8 tons of coal to manufacture 1 ton of aluminum.

"All around you there are useful products made of coal by-products. Foods such as baking powder and saccharin; household aids like detergents, polishes, dishes, pastes, insecticides and pencils; cosmetics and perfumes; and for music lovers, coal is used to make phonograph records.

"It may not be true that "clothes make the man"—but it is true that coal makes much of the clothing. Synthetic fibers made partly from coal . . . have been widely adopted in garment making because of their superior strength, resilience and durability. . . . Coal goes into the dyes that color cloth and shoes.

"Coal is strongly represented in your

home's construction.... The most popular types of roofing are made from coaltar products. The cement in the foundation required coal in its manufacture. Steel, glass, brick, tile, paints, varnishes and lacquers all have a basis in coal.

"Coal is a great humanitarian. Medical history, especially during the last few decades, bears witness to an impressive and growing list of coal's contributions. Coal derivatives are used in the preparation of scores of medicines, from simple aspirin to the most complex of today's wonder drugs. . . . In your home medicine cabinet, in the corner drugstore, in your doctor's office and in the hospital, you'll find coal guarding your health!

"Consider your car. Its body is made of steel protected by a coal-based paint. Its tires may be made of coal-derived synthetic rubber, ribbed with nylon cord or some other synthetic fiber containing coal. The glass in the windows, on the dashboard, in the mirror—is fashioned by coal-generated heat. Even the plastic seat covers require coal, and so does the highway, whether concrete or asphalt.

"Coal is the primary source for the production of many useful chemical products. Interesting examples are: naphthalene, important in plastics; creosote, the best known wood preservative; anhydrous ammonia, as a fertilizer; benzene for synthetic rubber; also, photographic chemicals, synthetic resins and explosives and many others.

"Coal's versatility as a servant of industry grows greater every day as research uncovers more and better methods of utilization. The limit of coal's usefulness is not in sight, and you will be the ultimate beneficiary of scientific discoveries yet to be made."



Bethlehem Wire Rope: Muscle for Dragline Excavator. Here's a close look at one of the husky twin draglines, attached to a 33-cu-yd drag bucket, stripping overburden in western Pennsylvania. Bethlehem lang lay, IWRC, improved plow steel is used for the 2%-in. draglines, which are 285 ft long, and for the 2½-in: twin hoist lines, each 477 ft long.

Bethlehem Steel Company, Bethlehem, Pa. Export Distributor: Bethlehem Steel Export Corporation

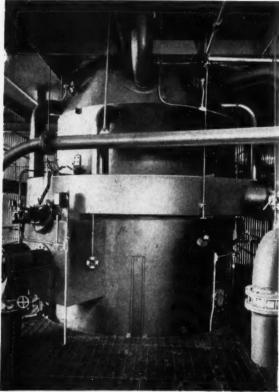
Mill depots and distributors from coast to coast stock Bethlehem Wire Rope

BETHLEHEM STEEL

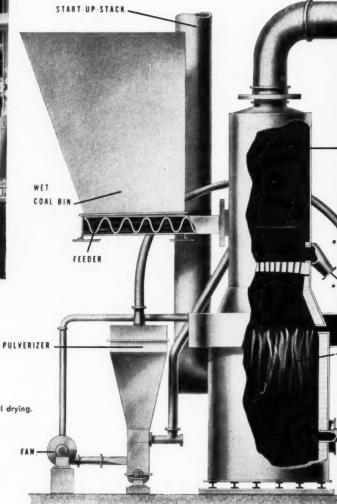


LEADING PRODUCERS CHOOSE FLUOSOLIDS®

for drying 2,300 tph . . . removing 40,000 gph of water in 7 modern plants

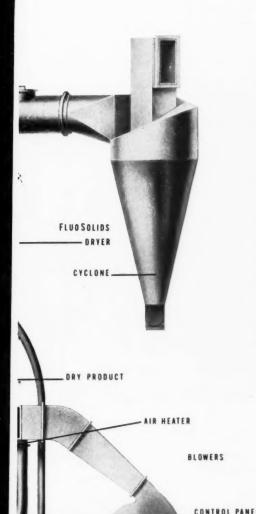


Rawer section of FluoSolids system at Peabody Coal Company's installation. Feed variations from 69 to 107 tph and total moisture variations from 10.1% to 22.4% are easily handled.



General arrangement of Dorrco FluoSolids system for coal drying.

LOCATION	START-UP	DRYER DIAMETER	CAPACITY TPH	WATER REMOVAL TPH	FEED SIZE
Indiana	July, 1955	7'	100	10.	1/4" x 0
West Virginia	Sept., 1957	2-14'	700	70.	36" x 0
Kentucky	Dec., 1957	14'	230	25.	5%" x 0
West Virginia	Oct., 1958	12'	230	17.	36" x 0
Pennsylvania	July, 1959	6'	140	6.5	36" x 0
Utah	Nov., 1959	14'	800	25.	1½" x 0
Kentucky	Oct., 1959	7'	100	11.	3%" x 0



Since the advent of the first successful application of fluidized techniques to coal drying, many of the industry's leading producers have selected the Dorrco FluoSolids system for coal drying.

The first installation . . . at Peabody Coal Company's Lynnville, Indiana preparation plant, started up in July, 1955. Operating information proved conclusively the advantages of fluidization compared with other methods of thermal drying. Subsequent installations have demonstrated that FluoSolids provides . . .

Wide capacity range—up to 800 tph of wet coal can be dried in a single unit. It is equally economical to dry 75 tph.

Wide size range of feed—system is capable of drying any feed ranging from filter cake on up to $1\frac{1}{2}$ " x 0 coal.

High water removal—up to 50 tph per dryer.

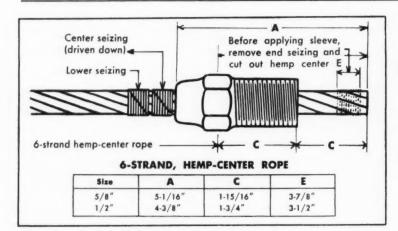
Controlled completely by instrumentation, operation is semi-automatic thus insuring uniform product moisture. With no moving parts within the dryer itself, maintenance is low and size breakdown is minimized.

Bulletin 7101, just off the press details the complete Dorr-Oliver line for the coal industry. For your copy, write Dorr-Oliver Incorporated, Stamford, Connecticut.

Dorrco & FluoSolids - T.M. Dorr-Oliver Inc., Reg. U.S. Pat. OH.



Operating Ideas

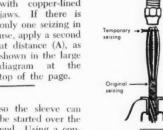


How to Install Connectors On Screen Suspension Ropes

Follow the diagrams through the numbered steps.



vertically in a vise with copper-lined jaws. If there is only one seizing in use, apply a second at distance (A), as shown in the large diagram at the top of the page.



4. Use a temporary seizing to again start the sleeve on the rope. Force the sleeve down to the original seizings.

on the jaws of the

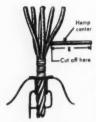
vise. Insert grooved

plug in center and



2. Before applying the sleeve, drive the end seizing close enough to the end of the rope

be started over the end. Using a copper bar or hardwood, drive the sleeve down until the rope projects to the dimension (C). Most of the required distance can be obtained by screwing the socket on the sleeve a few turns and hammering the end of the fitting.



3. Grip the rope in the vise just below the seizings

and remove the temporarily. Pull the hemp center to one side between strands so that it can be cut off at dimension E. Put hemp stub back in center of rope. Do not broom wires if plug is grooved. Wash grease from the rope with solvent.

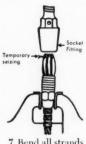


5. Grip the rope at the seizings so the end of the sleeve in final position bears solidly

arrange strands in grooves of plug. With hammer and punch, tap the plug down gently, meanwhile rotating by hand the strands of the rope in a direction opposite to the lay. This provides for better adjustment of the strands in plug grooves.



6. Drive the plug down to a moderate seat sufficient to hold rope, plug and sleeve together, then grip the sleeve securely in the vise. Now drive the plug in solidly, making sure it goes down as far as possible.

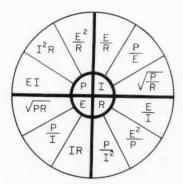


7. Bend all strands together and, if

necessary apply a 1-turn seizing to get all strands entered in socket. Remove seizing, and push or turn socket down until threads are engaged. Screw the socket down firmly. If it is properly installed, one or two threads will show on the sleeve. Remove seizings.



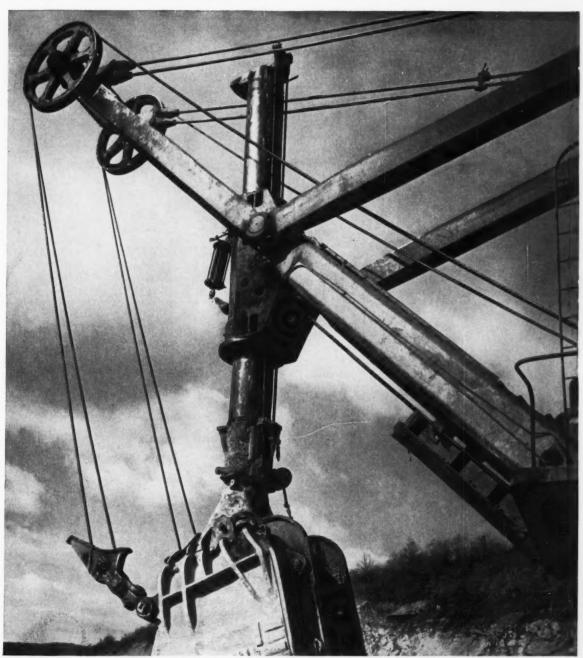
8. If the installation has been properly made, the strands will be fully visible and twisted across the inspection hole at an angle to the rope axis. - From Hewitt-Robins, Incornorated.



Handy Diagram For **Power Problems**

DO YOU have trouble remembering Ohm's law and how to solve DC power problems? Whether you do or not, this handy chart can make your problem solving easier. It works like this.

The circle is divided into four equal parts, each of which represents one of the values you may want to solve for if you know two of the three remaining values. The four letters at the center of the circle, P (power in watts), I (current in ampers), R (resistance in ohms), and E (volts) represent values you can work out by substituting the proper known values in one of the three expressions in the same quadrant as the value desired.



IF THE WIRE ROPE YOU'RE USING

HASN'T GOT IT HERE...IT HASN'T GOT IT



This rope has it—and has it at every critical point of wear for these reasons: Extra Resistance to Bending Fatigue · Extra High Strength Good Flexibility and Excellent Resistance to . Shock . Abrasion . Impact . Crushing For anything you want to know about Roebling Royal Blue Wire Rope, ask your Distributor or Roebling's Wire Rope Division, Trenton 2, N. J.

ROEBLING

Branch Offices in Principal Cities John A. Roebling's Sons Division . The Colorado Fuel and Iron Corporation

Operating Ideas (Continued)

How to Cut Wire Cloth Smoother, Faster

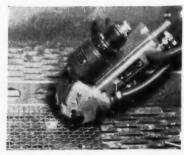
A WAY to cut wire cloth and expanded metal of any weight and alloy faster and easier is offered by Arcair Process torches. These materials can be cut, with either manual or automatic torches, at speeds of 48 in per minute. The cost of equipment and materials used is negligible.

Arcair torches use a special inexpensive electrode, welding current and ordinary compressed air. Heat from the arc melts metal instantly while the compressed air blows the molten metal out of the way.

The resulting cut is clean and smooth and, as a consequence, there is no need for special holding jigs deburring of the cut edge. Heat input to the metal is much lower than with flame cutting, so there is no problem of changing the properties of the metal. There is no need to preheat each strand of wire or expanded metal. The cutting is instantaneous.

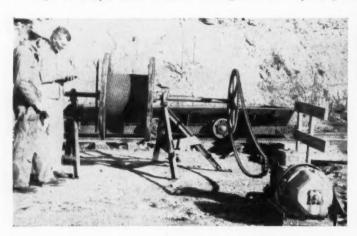
There are some disadvantages of cutting wire cloth and expanded metals with conventional tools. For example, shears can be used satisfactorily on the smaller fine-mesh products, but since the surface is not flat this method distorts sizes larger than Via in.

Flame cutting is slow since cutting each wire or cross member requires preheating. Heat doesn't pose a great prob-



lem though the cut is not too smooth and is slag encrusted.

A friction saw is fast but requires holding the material rigidly. It leaves very sharp burrs which are difficult to remove and makes this method uneconomical.





Power Reel Saves Aluminum Feeder

A POWER REEL saves wear and tear on aluminum feeder cable and keeps it looking brand new at Chafin Coal Co.'s No. 2 mine, Logan, W. Va., according to *Haulage Ways*, published by the Ohio Brass Co., Mansfield, Ohio.

Several sections of 1,590,000-cir mil aluminum cable recovered recently after being in service since 1956 are virtually free of nicks and scratches. Credit for this "kid glove" treatment, according to Oscar Damron, goes to the power reel shown in a temporary setup in the photograph. The reel rests on a long axle which turns in pillow blocks mounted on two steel sup-

ports. At one end of the axle is a sprocket wheel which is connected to a drive chain, through, a speed reducer, to a 15-hp motor salvaged from a scrapped elevator. An O-B motor starter completes the setup.

When this rig is mounted on a flatcar, cable can be spooled off or on quickly and easily without dragging on the bottom, without gouging or kinking the soft aluminum strands.

Two men, according to Superintendent Damron, can spool up and recover 6,000 ft of heavy feeder a day with this equipment. It also can be used for trolley wire.



Dump Truck Becomes Tractor

A REMODELED Hendrickson truck formerly on a dump-bed frame now is pulling 62-ton coal trailers at Hanna Coal Co., Cadiz, Ohio, according to the February, 1960 issue of *Hanna Coal News*.

Supervisor of Truck Maintenance Harry Horton, at the wheel of the truck, and his crew combined their skills to make the new tractor. They fabricated a new frame, put on a Euclid rear axle, installed a dry-type air cleaner and added Twin Disc torque converters with built-in brake. The truck now has a 12-cylinder Cummins diesel engine. It has been in service several months now and has been trouble free. Mr. Horton says that it has had only normal maintenance.



Where heavyweights move job records prove... FIRESTONES PULL HAUL COSTS DOWN!

Take a tip from nationwide construction records—Firestones lower tire costs per job! Here's why: Firestone off-the-highway tire dependability plus Firestone's Giant Tire Service keeps expensive equipment on the job and working. Firestones are built with Firestone Rubber-X, the longest-wearing rubber ever used in Firestone tires. Firestone Shock-Fortified nylon cord is a natural for off-highway loads—holds impact damage to the minimum. And your Firestone Tire Expert will help you match tires to the job as well as handle all maintenance problems. Turn downtime into worktime with Firestone tires and service! Call your Firestone Dealer or Store today.

WHEN ORDERING NEW EQUIPMENT ALWAYS SPECIFY FIRESTONE TIRES



BETTER RUBBER FROM START TO FINISH

TUBELESS OR TUBED



Super Rock Grip

Super Rock Grip

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*Firesione T.A

MISSING THESE

• 1. PRECISION-TAPERED PLUG

Expertly engineered for proper shell expansion. Angle of taper is at the precise degree required for strength, dependability, and quick efficient tightening. Whether in relatively soft formations or other types of rock strata, improved Republic Mine Roof Bolts assure best performance.

• 2. HIGH-STRENGTH, ALL-PURPOSE EXPANSION SHELL

New, improved Republic RS-1 Expansion Shell is designed for effective use in any type of strata. Wide, strong leaves and flaring inside taper mean extra holding power in relatively soft formations. Narrow base supports for the leaves assure easy expansion and a wedged-like grip as the anchor is tightened.

• 3. HEAVY-DUTY SUPPORT NUT

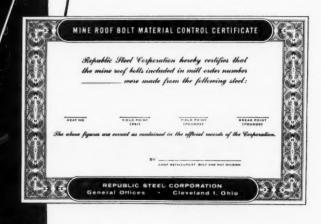
Square nut gives over 40% better support than even the best previous method, yet maintains correct bolt tension by stripping at approximately 50 pounds torque with no damage to bolt threads. Nut can be easily applied either side up—another plus feature.

. 4. IMPROVED SELF-CENTERING HEAD

Compact, one-piece head eliminates need for separate washer. The heavy flange and thick, reinforced washer are guided cleanly and firmly into position in the bolt plate. Entire unit is forged, for ruggedness and strength. Standard $1/\epsilon''$ head available with $3/\epsilon''$ and $3/\epsilon''$ bolt sizes.

. 5. MATERIAL CONTROL CERTIFICATE

Included with every shipment of Republic Roof Bolts is a certificate stating specific physical properties of the steel used. Data provided: yield point in pounds per square inch, yield and break point in pounds, and steel heat number. No guesswork about the quality you get from Republic.



FIVE CERTIFIED-PERFORMANCE FEATURES?

YOU ARE IF YOU'RE NOT USING REPUBLIC MINE ROOF BOLTS. Only Republic offers these five important advantages: Precision-Tapered Plug, High-Strength Expansion Shell, Heavy-Duty Support Nut, Material Control Certificate, and Improved Self-Centering Head.

With Republic Mine Roof Bolts you get the most important cost-reducing and safety factors of all-performance you can depend on, every time. Reason—

every step of their manufacture, from raw ore to finished bolt, is carefully controlled, precision-checked, and inspected. Steel chemistry, yield point, and break point are known quantities. No guess work—you get certified quality.

For more information on Republic's complete selection of bolts, roof plates, and expansion shells, mail the coupon now.

REPUBLIC STEEL



World's Widest Range of Standard Steels and Steel Products



MINE WATER PROBLEMS? Solve them the easy, low-cost way—with Republic Flexible Plastic Pipe. Made of tough polyethylene, it is impervious to corrosive elements found in mine water. Lightweight Republic FE Plastic Pipe is easy to handle, easy to cut and join. Can be quickly relocated to meet changing conditions. Mail coupon for further information about Republic Plastic Pipe.



UP THEY GO, fast and easy. Truscon Insulated Sidewall Panels—the modern, economical way to construct hoist houses, material and equipment shelter, field offices. Panels are built by sandwiching a layer of insulating material between two sheets of Truscon 24° Ferrobord® or galvanized ribbed sheeting. Securely interlocked for weather-tightness. Mail coupon for more data.



ABRASION-RESISTING PERFORMANCE of Republic High Strength Steel makes it ideal for use in coal and ore discharge chutes, hopper and mine cars. Equipment built with Republic High Strength Steel withstands continual pounding and abrasion, is more corrosion-resistant and weighs less than similar equipment constructed of plain carbon steel. Send coupon for additional information.

AVAILABLE PRE-ASSEMBLED TO CUT YOUR INSTALLATION COSTS

You can order your Republic Certified-Performance Roof Bolts fully assembled to save you assembly costs, prevent loss of parts and damage to bolt threads. Remember to specify Republic Roof Bolt Plates, too.

REPUBLIC STEEL	CORPORATION
DEPT. CA -9388	

1441 REPUBLIC BUILDING . CLEVELAND 1, OHIO

- Please send me further information on:
- ☐ Mine Roof Bolts
- ☐ Truscon Insulated Sidewall Panel
- Republic Plastic Pipe

☐ High Strength Steel

me_____Title_____

Company.....

Address

City Zone State

Equipment Developments

Connecting Pipe

"Plainlock," a simple low-cost method for connecting plainend pipe with positive-grip couplings and "Full-Flow" fittings, has been developed by Victaulic Co. of America, Elizabeth, N. J. The leak-tight method consists of couplings and fittings for use with plain- or beveled-end pipe. Two bolts on the coupling permit fast easy joining, and hardened stainless-steel grips which engage the pipe ends securely lock them together. An ordinary wrench is sufficient to seat the grips in the pipe or fitting ends. Fittings are available with plain ends or in combinations of plain and grooved and threaded or flanged for interconnection of other piping systems. Sizes run 1, 2, 21/2, 3, 4, and 6 in. The firm emphasizes that piping costs are reduced because no pipe end preparation of any kind is required.



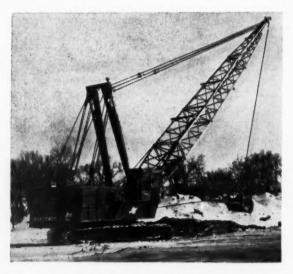
Improved Tractor Loader

Oliver Corp., 400 W. Madison St., Chicago 6, has made operating improvements in its new OC-96 tractor-loader. These refinements result in 100% speedup of load-moving cycles, according to the firm. Powered by a 4-cylinder valvein-head diesel engine, the OC-96 delivers 62 hp. Loadhandling superiority of the machine compared to earlier crawler-loaders is attributed to newly-developed speed features such as power steering and "Trans-O-Matic" transmission. A torque-converter increases engine efficiency and cushions shockloads on the power train, reducing maintenance and repair costs. Track length of about 6 ft, giving full 1,714 sq in ground contact, is the largest ever provided for a loader of this size, says the firm, resulting in top maneuverability. A low-profile design with all moving parts in front of the operator improves visibility.

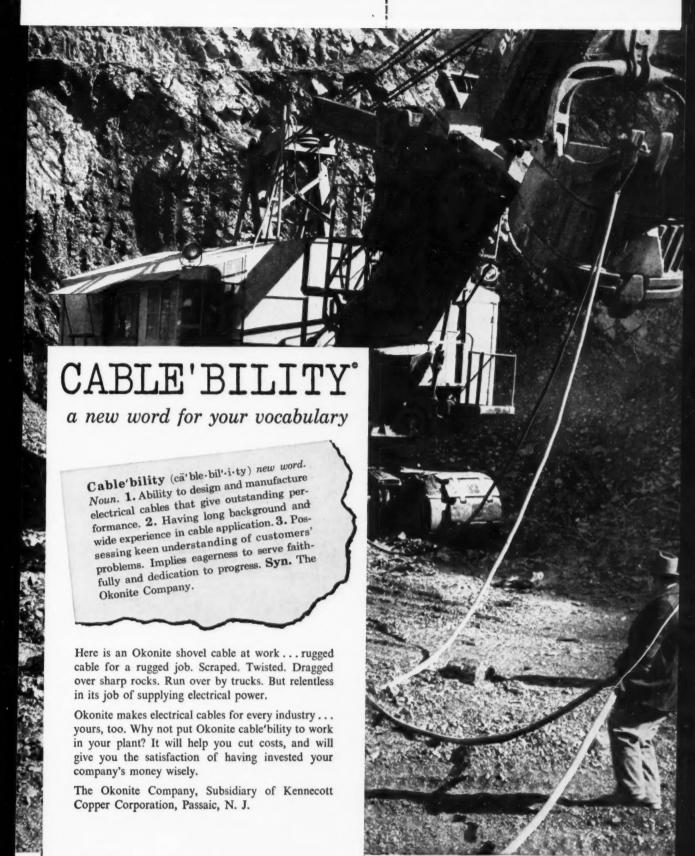


New Excavator

New design and performance is featured in Model 4500 Vicon 6-yd shovel or 7-yd dragline, from Manitowoc Engineering Corp., Manitowoc, Wis. The firm reports new "integrated" controls greatly simplify and speed operation. Elimination of clutch slippage is "revolutionary" in the industry, says the firm. There are no conventional engine throttles on the Vicon. Each clutch control lever in the pilot house is also a throttle. Engaging a swing or drum clutch involves simply pushing or pulling the clutch-control lever from dead center (stop) position. The further the lever is pushed or pulled in the natural direction of the machine's movement, the faster and harder it works in that direction. There is no slippage because the first 10 deg of control lever movement does not activate the throttle, thus clutch engagement is effected at low engine rpm and almost zero clutch and drum rpm. By continuing to move the clutch control lever, which is also the throttle, the machinery is accelerated via the fast smooth three-stage torque converter against the load. An added feature for better dragline performance is the interlocked hoist and drag drum, which maintains the proper relationship of speeds between the two drums automatically, requiring less operator coordination. This arrangement sus-



pends the dragline bucket in the middle of an endless line, cutting brake use up to 50%.





where there's electrical power...there's OKONITE CABLE

Equipment Developments (Continued)



SPARE PARTS—Electric Storage Battery Co.'s Exide Industrial Div., Philadelphia 20, has developed a ready-to-ship spare part kit for its vertical motorigenerator chargers used with electric industrial truck and mine locomotive batteries. The kit contains parts commonly needed for replacement after long use, such as brushes, bearings and fuses. There is a kit for each of the 25 sizes of Exide vertical motor-generator chargers.

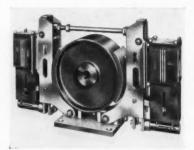


CUTTER BIT—A cutter bit for Jeffrey-type continuous miners is being marketed by Vascoloy-Ramet Corp., Waukegan, Ill. The bit, Type CHJ, features a wide (¾ in) nose, facilitating cutting in rugged conditions. A flange against the lug provides rigidity, preventing, wobbling, carbide breakage, bending. The bit is locked in place by a retainer pin through the hole in the shank.



TRACTOR-SHOVEL—Frank G. Hough Co., Libertyville, Ill., has announced an entirely-new tractor-shovel of a size and type never available in their "Pay-

loader" line. The Model, No. H-30, has an operating capacity of 3,000 lb and is equipped with 1-cu yd bucket. The 4-wheel drive features Hough's own full-power-shift transmission with matched torque-converter. With 3 speeds in each direction, all shifts can be made "on-the-go" with no need to stop for "range" shifts. The H-30 is powered by a 771/2-hp heavy-duty gas engine which, according to the manufacturer, provides more power than any other 4-wheel drive unit of this size and capacity. Clearance of 8 ft 4 in under the cutting edge with bucket in dumped position is even greater than some larger machines, as is the 29-in dumping reach ahead of the front tires, adds the firm.



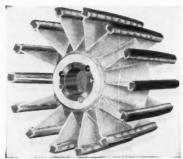
SOLENOID BRAKE—A new double-action solenoid-operated brake, from Trombetta Solenoid Corp., Milwaukee 2, is available in wheel diameters from 18 to 72 in and torque capacity from 1,400 to 75,000 ft lb. Two separate independent units operate the unit, either one of which can release the brake without the other. In event of a hoist breakdown because of solenoid failure, the alternate solenoid takes over. Result: elimination of downtime with resultant saving, says the firm.



CUTTING—The Bowdil Co., Canton 1, Ohio, has announced three new developments, thoroughly tested in the mine and found to improve production and reduce costs, according to the firm. The new "Thin Kerf" cutter chain is proving very popular in Virginia and West Virginia coal fields, says the firm. With a



quick-change double-edge bit, it lends itself best to use on machines delivering up to 15 hp and kerf of 3 to 3½ in, according to Bowdil. It reduces the amount of cutting to the point where higher feed speeds are realized, and cuts cleaner, it is noted. Another product is the new "super-strong" cutterbar, Series 80, now being built to fit all the newest heavy-duty machines. It is designed for use with the stronger new Bowdil chain and sprockets, says the manufacturer. Also, the new heavy-duty chain, Series 40-3, is in production, aids the firm.



PULLEY - A rubber-lagged "Turn-Clean®" wing pulley, said to be the first of its type offered by any manufacturer, has been introduced by Van Gorp Mfg., Pella, Iowa. The exterior edge of the wing is a U-shaped steel channel which receives a steel encased rubber bar. This high-tensile strength rubber bar provides an excellent surface for transmitting maximum traction to the belt, says the producer. Since the rubber lagging is an individual separated strip, it will compress on contact with the belt. When the arc of contact is broken, the rubber will spring back to its normal height and automatically clean itself. The firm notes that the rubber bars grip so tightly they do a superior job of spalling off dried materials on the underside of conveyor belts. Maintenance is decreased and belt life increased as a result, it is reported.

(Continued on p 166)





HERE'S UNRETOUCHED PROOF of how the new B.F.Goodrich Cut Protected compound wears longer. Both tires were in service at the same time on identical jobs under identical conditions. Yet the Cut Protected compound tire at the top has given approximately 900 hours more service than the tire below. Note how little the CP tread is worn.





TRUCKS HAUL 44 TON gross loads over razor-sharp rocks at this Pennsylvania strip mine. Here's a job for the B.F.Goodrich Cut Protected compound tire. If the problem were dangerous heat build-up, you'd choose the new Heat Resistant compound.

B.F.Goodrich develops 2 new long-wear tire compounds

B.F.Goodrich Cut Protected and Heat Resistant compounds boost tire life, cut costs on mine jobs

Tests show that B.F.Goodrich Rock Service tires made with new Cut Protected or Heat Resistant compounds outperform any other tires on the market.

Cut Protected compound gives longer service on jobs where:

- Rock cutting, chipping and abrasive wear are severe.
- · Round-trip hauls are short.
- Trucks travel at low speeds.

Heat Resistant compound defies dangerous heat build-up on jobs where:

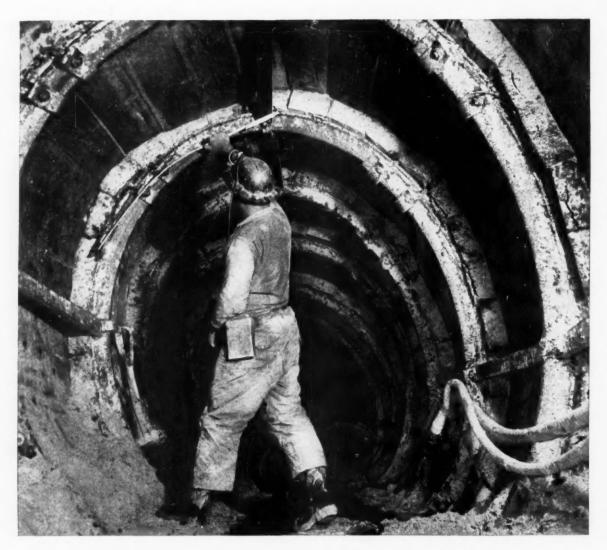
- Haul roads are well maintained.
- · Trucks travel at high speeds.
- Cutting and chipping are at a minimum.
 Intensive B.F.Goodrich research

and testing went into the development of these compounds. Only B.F.Goodrich makes Cut Protected, Heat Resistant, and Regular compound tires that are actually tailor-made for your type of work. Your B.F.Goodrich Smileage dealer will recommend the best one for you. He's listed under Tires in the Yellow Pages of your phone book. The B.F.Goodrich Company, Akron 18, Ohio.

Specify B.F.Goodrich Tubeless or tube-type tires when ordering new equipment

OFF-THE-ROAD TIRES BY





How far will a Yieldable Set yield?

In any discussion of the Yieldable Arch or Ring, the question is invariably asked: How far will the Arch yield? Answer: It is not unusual to have a Yieldable Arch set yield until the legs almost touch each other at the center.

Gives Ground Chance to Settle

That's the whole point of the Yieldable Arch; it is normal for the joints to yield. It's the old technique of letting the enemy beat himself. By gradually "giving" under excessive pressures, the Arch gives the overburden a chance to settle into a natural arch of its own, and thus bring forces into equilibrium. As soon as stability is reached, the Yieldable Arch holds the line. A set of Arches consists of curved, U-shaped sections nested

together and overlapped enough to permit clamping with two U-bolt clamps at each joint. The clamps control the degree of tightness, and permit yielding when the forces exceed the load for which the joint was intended. Each Yieldable Arch set is tied to adjoining sets by means of horizontal struts, which add lateral rigidity to the structure.

Usually Pays for Itself in a Year

Besides increasing mine safety, the Yieldable Arch offers high salvageability, and usually pays for itself within its first year of service. A Bethlehem engineer would like to discuss the application of the Arch to your roof problems.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL





HAVE YOU SEEN "THE MAN WITH THE RED VALISE"?

Every Hercules Explosives technical representative carries "The Red Valise" you see above. In it are dummies of Hercules® Blasting Caps; with it in front of you, you and the Hercules man can determine the best materials for your specific requirements.

Talking with the Hercules man is always a

good idea. He's been expertly trained in his field, and backing him up is a complete line of quality materials for the industrial explosives user. You can always receive the help you need from Hercules, either by contacting the Hercules sales office nearest you or by writing direct to Wilmington.



BIRMINGHAM . CHICAGO . DULUTH . HAZLETON . JOPLIN . LOS ANGELES . NEW YORK . PITTSBURGH . SALT LAKE CITY . SAN FRANCISCO

CF_&I-Wickwire develops

DOUBLE

New wire drawing technique gives you longer-lasting wire rope

CF&I-Wickwire's premium wire rope—Double Gray—has now been improved by a remarkable new wire drawing technique. This new wire rope—Double Gray-X—provides EXTRA LONG LIFE.

Wickwire's advanced wire drawing process is the joint effort of our research engineers, metallurgists and key production people. They sought to reduce the friction between the wires within the rope itself, thus producing a wire rope with greater resistance to bending fatigue. An important step in Wickwire's new wire drawing process is the use of molybdenum disulphide. "Moly Disulphide" builds a thin, permanent molecular shield around each wire. Coupled with Wickwire's other advanced wire processing techniques, it gives these results:

• Friction-free interaction of the individual wires in every strand of Double Gray-X—A molecular jacket of Moly Disulphide on each wire helps cushion them against the effects of bending, crushing and abrasion. As the rope operates over sheaves, for example, the molecular shield tends to prevent the wire surfaces from grinding against each other, reducing friction and wear.



a superior wire rope

GRAVEX

- Smoother surface to the wires In any wire, tiny imperfections occasionally form on the surface. These "weak links" can cause premature breaking of the wires and impair the life of the rope. Moly Disulphide helps eliminate any minute nicks, creating smoothersurfaced wires.
- Higher degree of toughness which is essential to longer wire rope life—Moly Disulphide greatly minimizes the friction involved in the drawing operation, thus preventing the wires from "heating up". This assures the correct physical properties for every wire in Double Gray-X and helps the wire retain its original toughness.

Double Gray-X will be made in a wide range of sizes and constructions to give greater operating economy and reduced downtime for all types of rope-using equipment. It will be available soon from CF&I-Wickwire's chain of warehouses and through a network of nationwide distributors.

EXTRA STRENGTH

In addition to longer life, Double Gray-X gives you the extra strength of Double Gray Wire Rope. Made of extra improved plow steel with an Independent Wire Rope Core, this rope gives 15% higher breaking strength than the catalog breaking strength of an improved plow steel rope with IWRC.

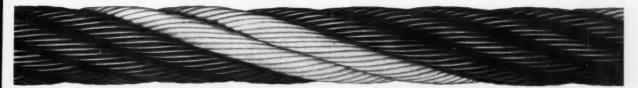
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WICKWIRE ROPE

THE COLORADO FUEL AND IRON CORPORATION

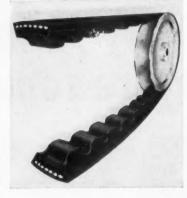


In the West: THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso Farmington (N. M.) • Ft. Worth • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Odessa (Tex.) • Oklohoma City Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Tulsa • Wichita In the East: WICKWIRE SPENCER STEEL DIVISION — Boston • Buffalo • Chattanoaga • Chicago • Detroit • Emlenton (Pa.) New Orleans • New York • Philadelphia





Equipment News (Continued)



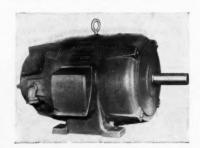
NEW V-BELT - A new fully-molded full-jacketed notched V-belt, which Raybestos-Manhattan, Inc., Passaic, N. J. claims features the only construction of its kind in the industry, is now available. Primary advantages of the belt, called the "CX," are quiet vibrationless running characteristics, ruggedness, and greater flexibility, permitting it to run more smoothly over smaller pulleys. In addition, the construction eliminates flex-cracking and increases fatigue resistance, says the firm. Raybestos says this patented notched V-belt outlasts other belts as much as 8 to 1 in actual performance tests. The belt offers more grip and is cool running, it is added.

DRIVES—Users of industrial drive systems are being offered a completely new engineering service, providing them an unbiased selection of drives at the most economical cost, according to General Electric Co., Schenectady 5. A comprehensive line of electric, mechanical and electronic adjustable speed drives, said to be "the most complete line available, bar none," is the reason behind the new

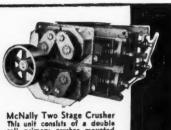
service, says GE. The line represents a range of ¼ to 1,250 hp, 2 to 6,000 rpm and a speed range up to 200:1. All the drives operate from an AC power source and provide constant horsepower, constant torque or both. Designed to meet every possible application requirement, the drives include remote preset speed control and a speed regulation of 10% to 0.1%.



BLASTING — Ammonium nitrate in a new pellet form said to increase the economy and effectiveness of AN blasting is announced by the Explosives Div., Atlas Powder Co., Wilmington 99, Del. The pellets are described as the optimum size and shape for better control over borehole density and oil absorption. Their excellent porosity permits them to readily absorb sensitizing agents such as fuel oil. They come in 50-lb and 80-lb moisture-resistant bags, and may be field-mixed by any method. Pellets are also available in pre-mixed form.



MOTORS—New wound rotor Life-Line^R
"A" induction motors designed for adjustable or constant speed drives that require special starting characteristics are available from Westinghouse Electric Corp., Pittsburgh 30. The new motors cover all standard ratings in frame sizes 254 through 326, which represent motors from 2 to 30 hp up to 1,800 rpm. The wound rotor induction motors are used wherever high-starting torque with low-starting current is required. The new line incorporates a Class B insulation system offering greater thermal sta-



McNally Two Stage Crusher This unit consists of a double roll primary crusher mounted above a double roll secondary crusher—compactly arranged into a single rigid structure.

Available From Stock and on Short Delivery
For immediate action on complete information write,
wire, or call

McNALLY PITTSBURG MFG. CORP.

Pittsburg, Kansas

Wellston, Ohio

GET REAL PRODUCTIVITY-GET A GM DIESEL



That's Superintendent R. L. Morrison of Snyder Brothers, Inc. in Cowansville, Pa., talking—and he's talking about the 34 GM Diesels his company uses in their coal, stone and sand business.

The Company has five different models from the GM Diesel All-Purpose Power Line powering pumps, dozers, graders, draglines, loaders, compressors and generator sets. Yet they back up all these engines with "only a handful of injectors and about \$10 worth of gaskets."

They put cylinder kits in one engine last winter—and in a second last fall. Mr. Morrison figures he won't need any kits this winter.

Snyder's GM Diesels are up to 16 years old—some have better than 10,000 hours on them. Mr. Morrison expects the "6-71's" on his generator sets to clock 15,000 hours before overhaul. And when overhaul time does come around, it will be mighty cheap—it cost them only \$300 to rebuild the "Jimmy" in their Le Tourneau-Westinghouse Super C Wagon after 6 years' service.

Keeping your engines out of the shop and on the job—cutting down on your parts stocks—spending only pin money for parts—are three good ways to boost your company's productivity and profits. Snyder Brothers is doing all three with "Jimmys" and you can, too. See your GM Diesel distributor—he's in the Yellow Pages under "Engines, Diesel"—or write direct for more information.



In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario.

Parts and Service Worldwide

GM DIESEL ALL-PURPOSE POWER LINE

sets the standard of Diesel productivity



The *Live Wire Rope Organization

*Charged with creative energy

To be dubbed "live wire" by customers is nice. But it also is a warning signal which alerts our organization to stay alive to the fact that a greater output of creative energy is necessary when you're in front running position.

In the Union research laboratory and in those of the steel producing organization in which Union is integrated, technicians are hard at work on many new projects. They were started and will be finalized in the field where Union engineers spend more time than in the laboratory.

Classic example of what results from such deep and constant probing is the Tuffy family of wire ropes and slings, each one of them engineered to a specific job. Among 1600 standard wire rope constructions, in day to day production, none could be classified as the ultimate low cost wire rope for bulldozers, draglines, scrapers or hoisting equipment. One by one new metallurgical specifications and rope and sling constructions were tailored to meet the different but tough operating conditions inherent in the jobs these machines perform.

Tens of thousands of applications have established the unchallenged supremacy of Tuffy special purpose wire ropes and slings



Tuffy Wire Ropes and Slings are "Job Prescribed" for Tough Jobs







Tuffy Balanced Scraper Rope



Tuffy Balanced Dozer Rope





At Mount Rushmore National Memorial in South Dakota small fissures in the sculptured faces of Washington, Jefferson, Lincoln and Roosevelt are being sealed with granite dust and white lead. Though the granite sculpture is estimated to last for thousands of years, this preventive maintenance will keep the surfaces smooth and slow the natural erosion process. The insert shows how workmen are suspended on Union Wire Rope.



For "Live Wire" Service-Look Up Your Union Distributor in the Yellow Pages

When you get him on the wire, you're sure to get the best in wire rope and slings-plus service that helps you get from Union Wire Rope products all the quality and long life Union builds into them. Union Wire Rope Corporation, 2130 Manchester Avenue, Kansas City 26, Missouri.





Rust—No. 1 enemy of steel—takes a heavy toll in wire rope life. The one-strand break shown here resulted when the rope was allowed to become rust-bound through lack of lubrication. Tests show that properly lubricated rope has up to 10 times the life expectancy of dry rope.



The Sunday punch for this piece of wire rope was delivered by a tractor cleat—just one of many crushing injuries caused by rope being run over or banged into by hard, sharp objects. Even the toughest wire rope is no match for this kind of mistreatment.



This rope jumped out of sheave and was soon destroyed by pulling around the shaft. Actually it was a case of sudden slack which threw the rope out of the sheave.



End of the line came quickly for this rope as the result of operating over a sheave that did not turn. Note the exceptionally heavy abra-sion on one side of the rope. Sheaves should be checked thoroughly and often.

Would you like a copy of a booklet in which more than a score of Tuffy Tips like those above are reproduced. If so, write Union Wire Rope Corporation, 2130 Manchester Ave., Kansas City 26, Missouri.

Tuffy Balanced Slings and **Hoist Lines**







Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division . Sheffield Division . The National Supply Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Southwest Steel Products



CARRIER GRIZZLY-FEEDER with full-range capacity control

Carrier Amplitrol Grizzly-Feeders accurately control material flow rates and simultaneously scalp "fines"—assuring maximum crusher capacity and efficiency. Uniform, full-width feeding prevents uneven crusher wear. Simple, automatic controls respond instantly to crusher load fluctuations—constantly adjust Amplitrol output to produce peak crusher performance without flooding or starving.

Compare These Amplitrol Features
More capacity under head load with
Natural Frequency design and
"long-stroke" trough vibrations.
Dust- and dirt-proof drive—no

close clearances to keep clean.

A.C. drive motor operates on standard power circuits—no D.C. rectifying equipment required. Simple mechanical drive—Ampli-

Simple mechanical drive—Amplitrol drives never need "tuning." Wear plates can be added in the field without difficulty.

For more information, write for Bulletin No. 591 to Carrier Conveyor Division, CHAIN Belt Company, ²¹² Jackson St., Louisville, Ky.

CARRIER

VIBRATING EQUIPMENT

CHAIN Belt Company



CONVEY • FEED

DEWATER • SCREEN

COOL • DRY

SCALP • COAT

DISTRIBUTE • ELEVATE

Equipment News (Continued)

bility, oustanding moisture resistance and inertness to chemicals and dirt, according to the firm. The limits on starting torque, pull-out torque, inrush current, temperature rise and other characteristics have not been changed from the Types CWP and CIP wound rotor motors which the new models replace.



HARDSURFACING—Tufanhard 375, a new extruded heavily-coated arc welding electrode from Hobart Bros. Co., Troy, Ohio, provides good wear resistance under medium impact conditions, says the firm. The weld deposit is non machinable but can be forged at red heat. It has a stable coating in which iron powder has been added for increased deposition. Standard package is 50 lb ner hos.



HARD-SURFACING WIRES—A new line of hard-surfacing wires for submerged-are automatic application was recently announced by the Hard Surfacing Div., Alloy Rod Co., York, Pa. Called "Wear-O-Matic," the wires are fabricated precision cold drawn to a tolerance of .002 in compressing the filler material to a near solid. This results in a weld deposit having highly uniform chemical and physical properties. Six alloys are being produced in 1/8, 1/82 and 1/86 in dia.

TRANSMISSIONS—Two new 15-speed transmissions for heavy-duty truck service are being produced by Fuller Mfg. Co., Kalamazoo, Mich. Designed for use in diesel-powered trucks and tractors in the 1,120-cu in class, the new transmissions, models 15-G-1120 and 15-H-1120,

Birth Of A Blast

Many unique tools are used by Spencer Chemical Company in blasting research. For example, these exclusive photos, taken at intervals of seven millionths of a second by a special camera, record the detonation of a 4-lb. mixture of Spencer N-IV Ammonium Nitrate and fuel oil.

Research like this, conducted by Spencer's own staff, and sponsored by Spencer at leading U. S. research centers, results in new and better ways to use Spencer N-IV and fuel oil for blasting.

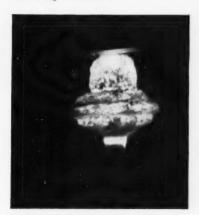
Spencer Chemical Company would like to share this knowledge with you. For information, use the coupon below.



2:13 P.M. The 13"-long charge, containing 94% Spencer N-IV Ammonium Nitrate and 6% fuel oil is about to be detonated.



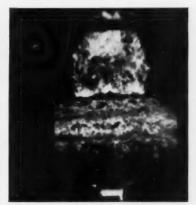
2:13.000028 P.M. The detonation wave has already spread over nearly one-third of the Spencer N-IV—fuel oil mixture.



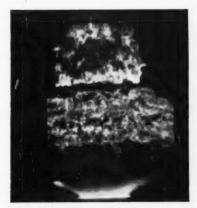
2:13.000056 P.M. This mighty, but controllable, energy is partly a result of N-IV's special structure and greater nitrogen content.



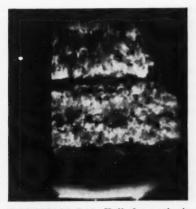
2:13.000088 P.M. Shown here is the great detonation velocity of the N-IV—fuel oil mixture. Yet, N-IV is safe to store and handle.



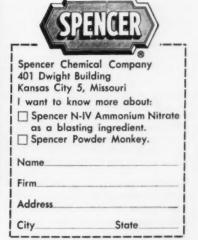
2:13.000128 P.M. The continuous and even release of energy shown here is a result of extensive Spencer research.



2:13.000160 P.M. Near maximum energy is now being released by the low-cost Spencer N-IV Ammonium Nitrate—fuel oil mixture.



2:13.000184 P.M. Full detonation! For information on how you can use Spencer N-IV Ammonium Nitrate, fill out, mail coupon at right.





A MAJOR ENGINEERING BREAK-THROUGH IN EXCAVATOR DESIGN

You get up to 25% more output with "integrated" controls, the "VICON" system of power application and control, and the new "interlock" drum arrangement

The Manitowoc 4500 Vicon is a 6 yard shovel or 7 yard dragline, incorporating an entirely new concept of excavator design and performance. Over 3 years of on-the-job-experience has proved its soundness of design, greater ease of operation; much faster operating cycles; greatly reduced maintenance costs; and far greater output from both shovels and draglines.

"Integrated" Controls Simplify Operation, Clutch Slippage Eliminated

Operating the Vicon is like flying . . . Cycle phases are that smooth, that "integrated"! Even green hands get results because it takes 50% less operator movement to run the machine.

Conventional engine throttles have been eliminated. Each clutch control lever in the high visibility Vicon pilot house is also a throttle! Engaging a swing or drum clutch, for instance, involves simply pushing (or pulling) the clutch control lever from dead center

(stop) position. The further the lever is moved in the natural direction of the machine's movement the faster and harder it works in that direction.

There is no slippage when clutches are engaged because the first 10° of control lever movement does not activate the throttle—therefore, clutch engagement is effected at low engine R.P.M. and almost zero clutch and drum R.P.M. By continuing to move the clutch control lever, which is also the throttle, the machinery is accelerated via fast, smooth, three stage torque converter against the load... without any clutch slippage.

No Brakes Needed To Stop The Swinging Action

In conventional excavators it is normal to apply considerable "braking" effort to halt the "swing" of the machine so that it can be started in the opposite direction. Before "Vicon" it was necessary for the opposite clutch or swing brake to take this thrust (the disadvantages of excessive friction heat and wear are obvious). With Vicon the machine stops swinging one way and very smoothly accelerates in the opposite direction because the torque converter acts like a brake, absorbs directional thrust, eliminates shock and slip on the swing frictions and then provides instant acceleration for the return swing.

Engine Application Has Great Versatility

"Vicon" is two engine power applied in a way never before used for power shovels and draglines... and with boundless advantages in performance, maintenance characteristics, and production! One engine provides the power for swing and travel while the other powers the drums... allowing you to perform several functions simultaneously, in a smooth blending of cycle phases that provide operating speeds beyond the capabilities of conventional excavators.

Vicon design gives you faster, smoother clutch engagement with drastic improvements on the conventional problem of wear, heat and fade . . . yet you maintain top working speeds.

With the Vicon power application, certain operating advantages are immediately obvious . . . For instance, one engine may be slowed down to accommodate an extremely tough phase of the cycle without jeopardizing the ability of the other engine to immediately take over the following phase of the working cycle. Or, one engine may complete its assignment at a relatively high speed while the power of the other is introduced at idling R.P.M. to take over the next phase of the work. Valuable production time is not lost because of engine "lug down". On the other hand, clutches are not jammed into engagement at high and harmful engine speeds . . . The result, a smoother, faster, more economical operation with greater output, longer machine life, better all-around performance.

"Interlock" Reduces Brake Use By 50%

Vicon operation is so smooth that the machine seems to loaf on the job. Yardage totals, however, tell the true story. For instance, on the Vicon dragline you get the new "interlock" drum arrangement which suspends the dragline bucket in the middle of an endless line... cuts brake use up to 50% and you take advantage of full horsepower on the hoist (instead of burning it up on the brakes).

Vicon Has Doubled Drum Brake Capacity

You get higher speed dragline cycles than were ever before possible—and designed into this new Vicon component is another innovation included specifically to give pin-point control and increase production.

Both outside flanges of both the front and rear drums of the Vicon serve as big, fast acting efficient braking surfaces. The advantages are readily apparent on various stripping locations where the operators take pride in maintaining such pin-point casting control that they actually trim and maintain vertical side walls. It is common, for instance, to see a Vicon operator taking advantage of Vicon "Interlock" making high



speed casts with the bucket held in a vertical position (teeth down). The bucket rushes out at full speed, is stopped smoothly over the top of the cut and then allowed to drop vertically to trim the wall. Vicon dragline drum "interlock" and drum brakes are in a class by themselves. Production gains are assured!

Other Innovations Are Yours With Vicon

For instance, a big universal radiator system gives you double the cooling capacity. Advantages of the Vicon cooling system are never more obvious than in prolonged travel with the Vicon maneuvering easily from one job location to the other. Travel, a situation embodying the most serious over-heating possibilities for the conventional machine, is no problem for the Vicon . . . which simply utilizes two engine cooling capacity for the operation of a single power system.

Shovel Has Less Weight—More Power On "Business End"

The Vicon shovel has all the advantages of the big, tough Model 4500 tubular style dipper stick and having separate hoist lines rigged from either side of the shovel bail to the other end of a reduction drive mounted on the base of the shovel boom—eliminating the weight and instability of a bail sheave at the bucket, plus bad fleet angles on the hoist cables.

There are many, many more design and operating features adding up to more output—reduced maintenance costs and lower cost yardage. Before you buy any machine in this class, it will pay you to get the complete story on the sensational 4500 Vicon.



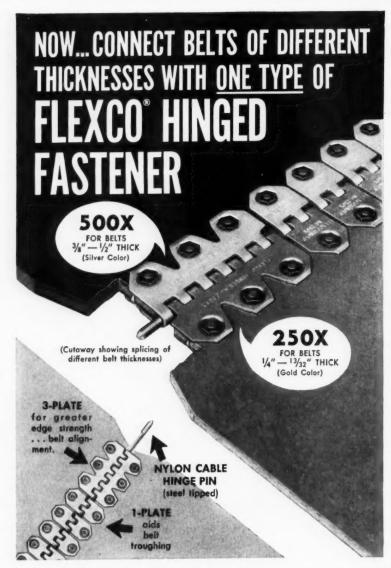
MANITOWOC ENGINEERING CORP.

(A Subsidiary of The Manitowoo Company, Inc.)
Manitowoo, Wisconsin

SHOVELS 11/4 — 6 YDS. CRANES 25 — 125 TONS

DRAGLINES

TRENCH HOES



CUT FASTENER APPLICATION TIME IN HALF BY USING THE NEW

- FLEXCO SPEED TOOLS with an impact wrench.
- FAR-PUL BELT CLAMPS—the easiest, quickest way to pull belt ends together.
- ALLIGATOR WIDE BELT CUTTERS—assures straight cut.
- EASY "CLIP" METHOD newly designed clips hold fasteners in correct position while nuts are being run down — no other alignment tool required (clips included with every carton joint).

HANDY PACKAGING



Complete splices of 500X and 250X fasteners for any given width of belt available in cartons (carton includes pins, bolts, nuts and clips).

ORDER FROM YOUR DISTRIBUTOR, or write for bulletin 500X.

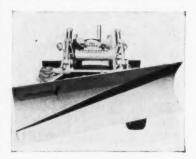
Hexible STEEL LACING COMPANY

4638 LEXINGTON STREET

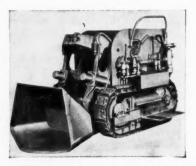
CHICAGO 44, ILLINOIS

Equipment News (Continued)

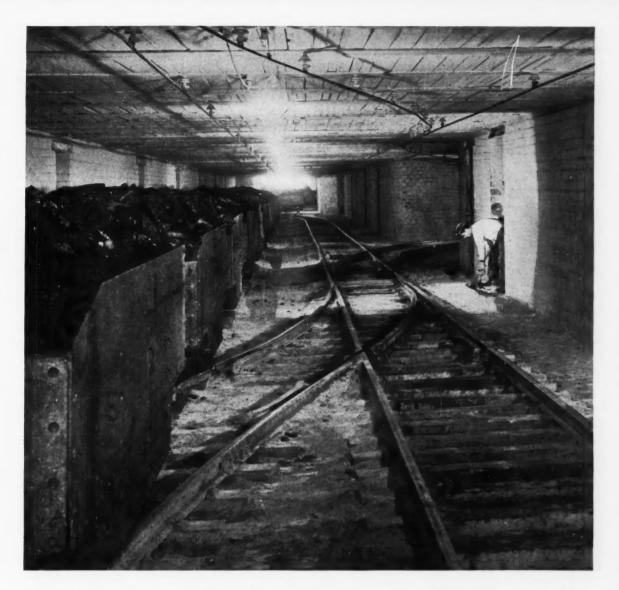
are designed especially for combination on- and off-highway applications such as aggregates, construction and other heavy jobs. Advantages of the new transmissions are reported to include: extremely short installation dimension; maximum operation flexibility; wide choice of optional gear ratios; and weight reduction obtained by eliminating support brackets, joints, cross members and a propeller shaft. Other features, says the firm, are high capacity, long life and ease of operation.



DOZER-Hydraulic tilt control is one feature of the new Balderson BA944 Angledozer when attached to Caterpillar Tractor Co.'s new No. 944 Traxcavator, reports the manufacturer, Balderson Inc., Wamego, Kan. Designed to increase the usefulness of Caterpillar's latest wheeltype loader, the Balderson attachment mounts on the lift arms in place of the bucket. When used in straight position, the extension brace folds in behind the blade. Hydraulic pitch control is obtained, when used as a straight dozer, by actuating the bucket dump cylinders. The BA944 blade measures 35 in high by 10 ft 2 in long. When angled to the right or left at 25 deg, it cuts a 9 ft 2 in path.



LOADER—Eimco Corp., Salt Lake City 4, Utah, has been granted a patent on a rocker arm rail used on Eimco Model 630 excavator-loader. The new rail permits Eimco to lower the rolling path of the overhead rocker arm on this equipment without reducing the required strength of the rail elements supporting the rocker arms during operation. With a headroom limitation in a mine or tun-



Turnouts so smooth you hardly know they're there

You roll through this crossover as smoothly as if there were no turnouts there. That's because this one was designed and tailor-made for the job by Bethlehem men who specialize in mine trackwork.

The rail is in the 85-lb class to assure efficient haulage not just today but in the heavier-traffic days ahead. All components were expertly built to exact size, pre-curved where necessary, then completely assembled at our plant to cinch a perfect fit at the final site. Every detail was thoroughly planned right from the start; nothing left to the cut-and-try and by-guess-and-by-golly methods.

Yet, for Bethlehem this was not a "special" job. Every mine-track problem gets the full treatment, as you will find when you talk to a Bethlehem engineer about your needs. You'll like his cooperative attitude, and his intimate knowledge of mining that lets him keep right up as you outline what you have in mind.

Why not call in a Bethlehem engineer right now? He will welcome the chance to help with your problems, and is available through the Bethlehem office most convenient to your own.

BETHLEHEM STEEL COMPANY BETHLEHEM, PA. Export Distributor: Bethlehem Steel Export Corp.

BETHLEHEM STEEL



720 tons of coal per hour loaded safely with Union Switch & Signal Car Retarder System

At U. S. Steel's coal cleaning plant, Corbin, Kentucky, a system of four car retarders is used to direct coal cars through loading, weighing and coupling operations. This Union Switch & Signal Car Retarder System places cars with speed and accuracy, eliminates a safety hazard and results in a substantial operating saving.

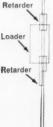
Empty cars are moved to the loading track where the pushbutton-controlled retarders take over while the cars are loaded. Cars next run by gravity to the retarders at the scale house, are weighed

and then run by gravity to a collecting point at another retarder. The entire job is handled quickly and economically by two operators. In three years of operation, the system has been trouble-free and maintenance-free.

Let us help solve your car control problems. We will be happy to discuss with you-without obligation on your part-how a Union Switch & Signal Car Retarder System can speed up operations, promote efficiency, reduce safety hazards. Write today for more complete information.

The first retarder receives and controls empty cars before the loading. Under the loader the cars are slowed down by the second retarder, then move gradually to receive an even load distribution. The third retarder slows the loaded cars for accurate weighing. Just before the coupling, the cars are brought to a complete stop by the fourth retarder.

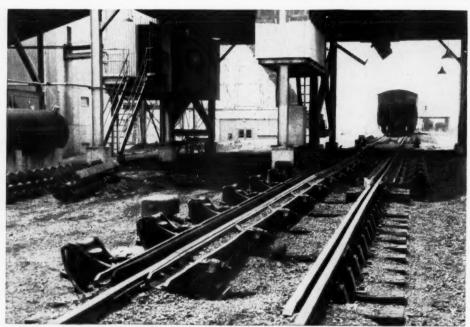
Empty cars moving to loader are controlled by first retarder, in background. This retarder arrangement provides for availability of 8 empty cars in advance of loading point. As loading progresses, second retarder, in foreground, controls movement of cars being loaded. This system of car handling moves cars with accuracy, assures a full, evenly distributed load.



Retarde

Scales

Retarde



UNION SWITCH & SIGNAL

DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY

SWISSVALE, PENNSYLVANIA

To clean coal yard

NEW YORK PITTSBURGH CHICAGO SAN FRANCISCO



HENDRIX Heavy Duty Mining Buckets

- LESS DOWN-TIME
- MORE PRODUCTION
- LESS MAINTENANCE
- LOWER COST-PER-TON

 $4\frac{1}{2}$ to 14 Cubic Yards With or Without Perforations

HENDRIX MANUFACTURING CO., Inc.
MANSFIELD, LOUISIANA





Equipment News (Continued)

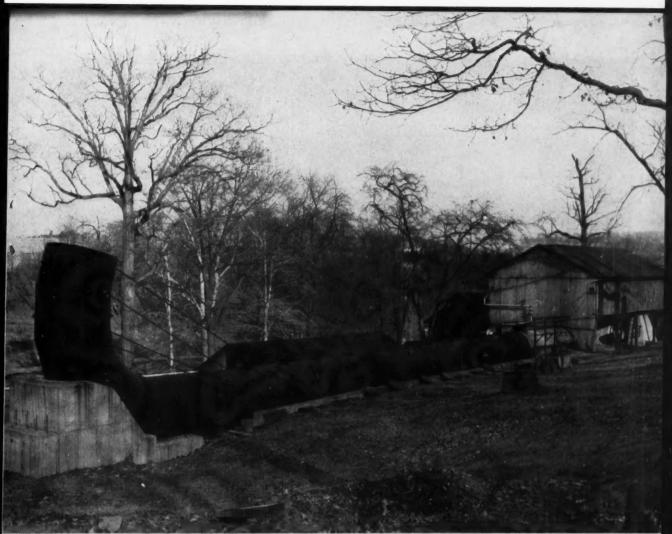
nel, higher cars or trucks can be loaded efficiently by use of this invention. The Eimco 630 is a crawler-type machine for underground rock or mineral loading and can be powered by air or AC electric motors.



SURVEYING—Lightness, speed and accuracy are features cited for an improved surveying device to measure distance electronically by The Geodimeter Co., Div. of AGA Corp. of America, South Plainfield, N. J. Called Geodimeter Model 4A, the unit permits faster measurement of unknown distance. Pointing time is reduced as much as 25% through use of an enclosed coarse pointing sight. Model 4A contains a Kerr cell heater, permitting its use in extremely cold weather, and it features a holder for spare projection lamps built into the body of the instrument.

FLANGE BLOCKS-To its line of No. 900 tapered roller pillow blocks, Browning Mfg. Co., Maysville, Ky., has added tapered roller bearing flange blocks available in shaft sizes 13/16 through 215/16 in. The firm notes that the housings are unbreakable malleable iron and that they are the only heavy duty bearing units with eccentric locking insuring a firm grip to the shaft even under shock loads. Steel Centrap seals retain lubricant and keep dirt out by centrifugal force, which permits excess grease to drain from the bearing in case of over lubrication. Bearings are sealed both on and off the shaft and elongated bolt holes permit replacement of competitive pillow blocks and provide more adjustment. The firm has also introduced a new line of V-belts, Type 358, available in 3 cross sections: % in top width, % in top width and 1 in top width. These "Gripbelts" are oil and heat resistant and static conducting for dissipation of static electricity.

LUBRICANT—A new multipurpose automotive lubricant for commercial and fleet operation has been announced by Shell Oil Co., New York 20. Shell



Effectiveness of salt as an outstanding catalyst for safety was proven here at the U.S. Bureau of Mines Testing Gallery at Bruceton, Pennsylvania. (Photo courtesy U.S. Bureau of Mines.)

GALLERY TESTS PROVE ...

added safety margin of Du Pont HIGH SALT Permissibles

Salt and ice have long been used to freeze other substances. Now, in its high-salt permissible dynamites Du Pont utilizes salt to cool the flame of an explosion... to make Du Pont Permissibles even safer to use in gassy and dusty mines.

Test after test in the U.S. Bureau of Mines testing gallery, with each test explosion accurately recorded in every detail, has proved salt to be an outstanding catalyst for safety. A year and a half of actual underground use has proved that ten percent of sodium chloride neither adds nor detracts from the performance of the explosive but it does make the flame of the blast much cooler. The result, according to our interpreta-

tion of the Bureau of Mines data, is a reduction of at least 50% in the tendency to ignite coal gas.

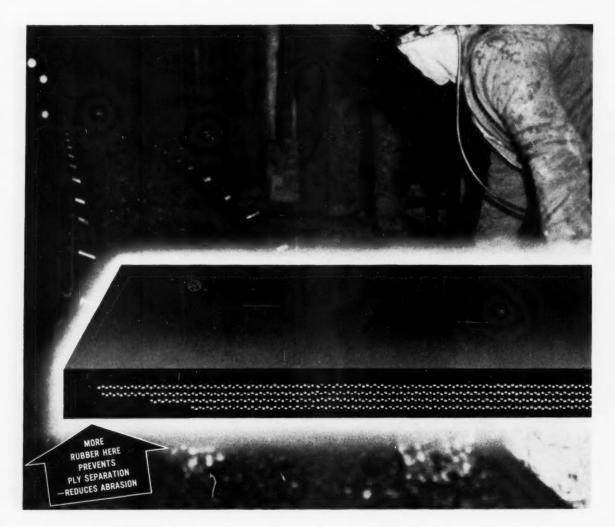
This does not mean that any changes are recommended in the handling or use of permissibles. It does mean that human failure, something which must always be considered, has less chance to cause a disaster.

Today, through research, the lives of all those who must dig coal beneath the earth's surface are safer.

For complete information on how Du Pont's high-salt permissibles can increase safety for your miners, call your Du Pont representative or distributor or write directly to Du Pont, Explosives Department, 6440 Nemours Building, Wilmington 98, Del.



BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY



EXCLUSIVE "COLEDGE" CONSTRUCTION

gives Thermoid Conveyor Belting extra life where it counts

Unique "Coledge" construction puts more rubber at the edges where it's needed, prevents ply separation, makes a more flexible and wear resistant edge where abrasion is greatest. Punishment at the edges—especially the tough use dealt out in mining—can kill most conveyor belting in a fraction of the lifetime of Thermoid-Quaker belting.

Tests show Thermoid-Quaker "Coledge" construction lasts and lasts on the same jobs where other belting fails. "Coledge" construction is available on all grades of Thermoid-Quaker belting.

What's more, all Thermoid-Quaker conveyor belting is prestressed in manufacture, so that the belt is actually in compression when you get it—ready for the heaviest load without strain.

Examine Thermoid-Quaker Belting with the exclusive "Coledge" construction at your Thermoid distributor's, or write for further information to Thermoid Division, H. K. Porter Company, Inc., Tacony & Comly Streets, Philadelphia 24, Pa.

*Patent Applied For

THERMOID DIVISION



H.K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION: PEERLESS ELECTRIC DIVISION; Specialty Alioys—RIVERSIDE-ALLOY METAL DIVISION; Referractories — REFRACTORIES DIVISION; Electric Furnace Steel — CONNORS STEEL DIVISION, NOULDINGS DIVISION, HOLD STEEL DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S. A.; and in Canada, Refractories, "Disston" Tools "Federal" Wires and Cables "Nepcoduct" Systems—H. K. PORTER COMPANY (CAMADA) LTD.



Low per-ton costs—with Sun's simplified underground lube program

Simplify your underground lube inventory by using two Sun products, and what happens? Your machinery runs longer and better . . . maintenance inspections become less frequent . . . and your production costs per ton go down.

Sun 740-A EP makes possible this decrease in inventory and increase in efficiency. It's recommended for all points of lubrication requiring daily maintenance, except hydraulics. It's a semifluid, extreme-pressure lubricant. It sticks like grease . . .

and flows like oil. Sun 740-A EP resists heat and water, and protects parts against rust and corrosion.

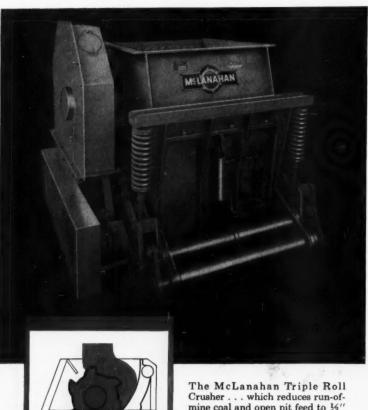
Its full name is Sun Prestige 740-A **EP Universal Mining Machinery** Lubricant. And, the only teammate it needs is a Sun hydraulic oil.

Your Sun man can tell you the whole story. Or write to Dept. CA-4, SUN OIL COMPANY, Phila. 3, Pa. In Canada: Sun Oil Company Limited, Toronto and Montreal.



MAKERS OF CUSTOM-BLENDED BLUE SUNOCO GA

IMPROVED TWO-STAGE



More uniformly-sized product results from this two-stage combination: Large-diameter toothed roll does the primary work against a curved crushing plate; with double rolls performing the second-ary reduction.

The McLanahan Triple Roll Crusher... which reduces run-of-mine coal and open pit feed to ½" and smaller in a single pass... has been refined to make it even more adaptable for high-tonnage operations. Rolls now are gear driven, and larger size rolls are available.

NOW AUTOMATIC TOGGLES,

an optional feature, protect against tramp iron. Attached to the movable secondary roll, the Toggles open to pass uncrushable material, then immediately return the roll to the original setting—without stopping the crusher.

Ask for New Bulletin TR-20.

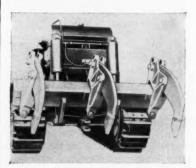


Equipment News (Continued)

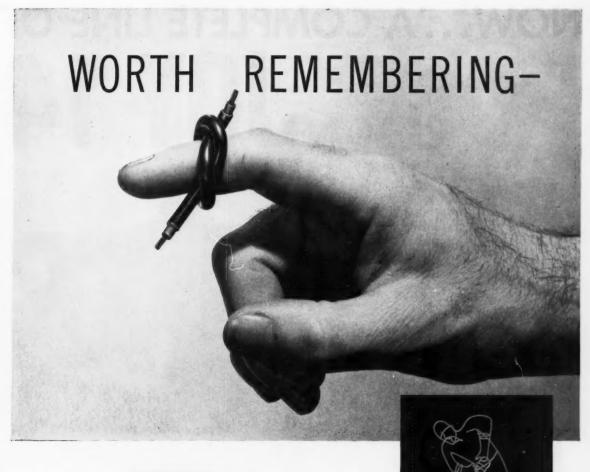
Darina grease AX is designed to lubricate mobile equipment under adverse and extreme climatic conditions. It is based on a new waterproof Microgel thickener developed by the firm. In washout tests it has been found that loss of grease was less that 1% at temperatures of 90 F and 175 F. Water absorption tests show that saturation neither reduces excellent performance of the lubricant nor impairs its metal adhesion characteristics, says the company.



TERMINAL—A quick-disconnect terminal assembly for brushes is available from National Carbon Co., Div. of Union Carbide Corp., New York 17. Designed to facilitate brush replacement on electric utility equipment and on any motor or generator in which the brushes are difficult to reach, the assembly is already under test by several equipment manufacturers. The assembly consists of a stationary clip easily bolted to the machine, into which either one or two terminals can easily be snapped. All parts are silver-plated beryllium-copper for minimum resistance.



HYDRAULIC RIPPER—"The Brute," new hydraulic ripper made by Greenville Steel Car Co., Greenville, Pa., for the International-Harvester TD-25, penetrates to 48 in. Adjustable for varying depths, the machine has shanks which swivel 15 deg in either direction allowing points to "float" beneath the ground, seeking out cracks and weak points in rocks. The ripper is stronger and heavier permitting operators to take full advant-

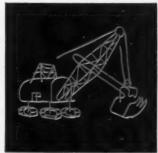


TIREX is Incomparably Flexible!

The wonderful flexibility of Simplex-TIREX assures easy reeling, coiling and handling. But beyond this, TIREX offers other important features, too.

TIREX cords and cables are cured in lead, by an original process which results in a perfectly smooth, uniformly dense, abrasion-resistant rubber jacket. TIREX cords and cables are rugged, light, and easy to handle, and won't snag or tear. And their neoprene jackets give balanced resistance to abrasion, water, acids, oils, sunlight and flame.

Millions of feet of TIREX are in use everywhere—on the job transmitting power for mobile mining equipment, construction machinery and portable tools of all types. Investigate how Simplex-TIREX cords and cables can help you.

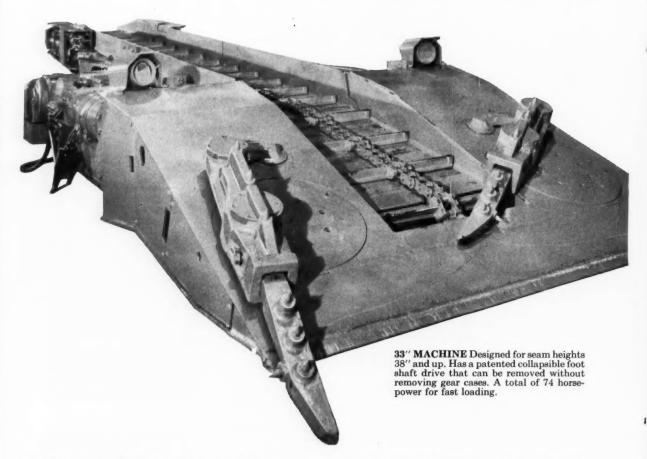




"The American manufacturers of transoceanic telephone cables"



NOW...A COMPLETE LINE OF JOY 14



Joy's new line of 14BU-10 loaders is a family of high-production models that fits every mining condition. All have the same basic design—built for production, dependability and ease of maintenance. They have "swing-out" electrical panels for easy access to electrical controls. Each gear case is easily removable as a unit. Motors, hydraulic pump and other mechanical elements are all mounted on the outside of the machine for easy inspection and maintenance. There are no shifting clutches, torque converters or complicated linkages.

The 14BU-10's load faster because they have a wider loading head and a controlled gathering arm speed of 50 RPM (no "egg-beater" action) tied to loading tram speed. A straight through conveyor, thirty inches wide, loads out the largest lumps with

ease. Tramming is fast because of a simple two-speed system. Two 15 hp motors run in series for slow tramming; in parallel for fast tram.

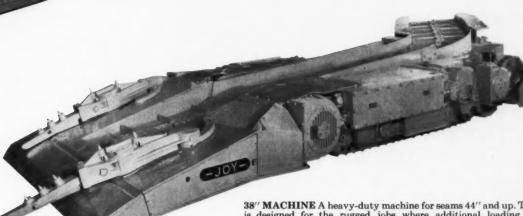
Ground clearance is never a problem because of a unique design feature. The box frame type chassis has been eliminated by placing two solid shaft members as cross ties between the crawler frames. Coal cannot accumulate under the conveyor. The absence of chassis frame eliminates chance of dirt build-up. Weight (1500 lbs.) ordinarily used in a box frame is now centered over the crawlers.

Every model of the 14BU-10 has all these features; is designed to load more coal with less maintenance. Your Joy engineer has complete information on the 14BU-10, and can help you choose the proper model for your operation. Or write for Bulletin 1217-1.

BU-10 LOADERS



24" MACHINE A really low machine with high capacity; loads 10 to 12 tons per minute. Has a conveyor pan line only 14 inches high, the lowest in the industry, for loading out large lumps in seams as low as 28 inches. (Also available with a 24" wide conveyor—loader 6 inches narrower.)



38" MACHINE A heavy-duty machine for seams 44" and up. This model is designed for the rugged jobs where additional loading power is required. Has separate rear conveyor motors mounted on conveyor. Reversing conveyor permits independent operation of conveyor and gathering arms. Roller crawlers are standard equipment. (Also available is 38" machine without separate conveyor motors.)



WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING MACHINERY

JOY

Joy Manufacturing Company Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario



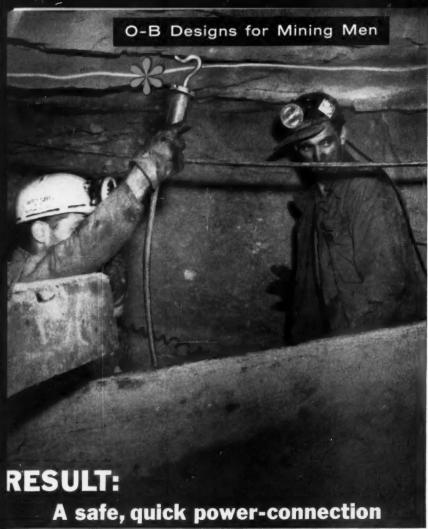








1217



for portable equipment in fast mining operations

O-B FUSED TAP HOOKS UP FAST with a wide selection of contacts — hook, clamp, plier-type or other standard types. The O-B unit will allow you to put power to work . . . quickly and safely . . . right where you need it!

PROTECTS MEN AND EQUIPMENT . . . cuts power off the line when trouble occurs. Sturdy, explosion-resistant case safely isolates mechanical and electrical impact of circuit breaking. Top-mounted release vent protects the operator.

FOLLOWS FAST MINING OPERATIONS. Almost as easily as plugging in a light in your home, you snap on your ground-clamp . . . put your equipment to work in a new place simply by hanging this handy unit on the line.

Save safely . . . with this fused power-tap from O-B. See your local O-B representative for further information and prices or write us now. Ohio Brass Company, Mansfield, Ohio. Canadian Ohio Brass Company, Ltd., Niagara Falls, Ontario.

Ohio Brass (B)

EXPANSION SHELLS AND PLUGS . LINE MATERIALS . SAFETY AND CONTROL EQUIPMENT . ELECTRIC HAULAGE MATERIALS

HOLAN

Equipment News (Continued)

age of the IH-TD-25's increased power. The rear end of the tractor remains clear for other use when the ripper is retracted. Straight shanks in 24-, 42- and 48-in digging lengths are avilable as well as curved shanks in 24-in lengths for use in non-block or non-slabby materials. Inquire about other attachments.

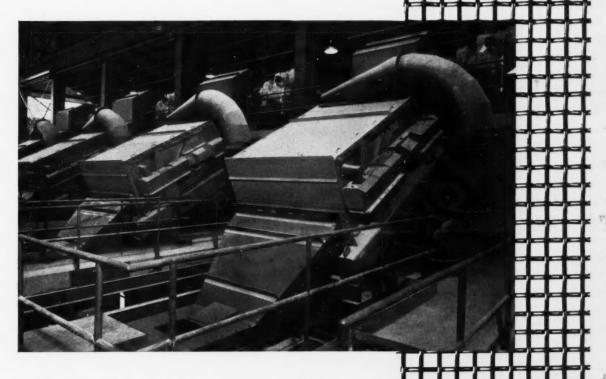
SHUTTLE CARS - New single-motor torque-converter shuttle cars with capacities from 375 to 455 cu ft have been introduced at National Mine Service Co., 2530 Koppers Building, Pittsburgh 19. The TorKars, designed to haul 15 tons of coal or rock on 25% grades, have basic over-all height of 60 in. The units supplement the firm's diesel-driven Type 60ED TorKars. Electrically driven, the machines have a 375-cu ft capacity which can be increased to 455 cu ft by using 8-in sideboards. A 75-hp motor powers the drive, conveyor and hydraulic pumps. Featured is an improved braking system with hydraulically-operated geared disc brakes at each of the 4 wheels, assuring safe stopping under severest conditions.

LIMIT SWITCHES - The problem of limit-switch failure has been mastered with introduction of a new line of switches, reports Cutler-Hammer, Milwaukee, Wis. Made for use on high-speed machines, C-H limit switches are oil-tight and ideal for installation where high impacts and adverse environmental conditions might cause failure of "standard" limit switches, says the firm. One C-H feature is enclosed but visible contacts. achieved by use of a new thermoplastic material. Switches are calibrated to control tolerances producing identical operation of all switches. They are available in both surface- and flush-type mount-

Equipment Shorts

More Capacity—Caterpillar Tractor Co., Peoria, Ill., says capacity of its No. 435 scraper has been increased 14% to 15 cu yd struck and 19 cu yd heaped in the new Series D model. Other features of the new model are greater flotation, draft frame improvements including thicker top and bottom draft plates, a stronger spreader tube and a 34% stronger gooseneck.

Welding Machine — A "revolutionary" moving coil design in a space-saving "Low Boy" cabinet, custom-assembled accessories and competitive prices highlight its new Premier line of standard AC welding machines, reports A. O. Smith Corp., Welding Products Div., Milwaukee 1. The line's 300-, 400-,



These TYLER screens floatso you save structural costs

This battery of Tyler vibrating screens, in a plant of the latest design, is handling copper ore at a high production rate, and does its work without transmitting vibration to the base frame of the screen.

The vibrating screen body—as well as the drive shaft—floats on special rubber mounts. And moving parts are designed to be in dynamic balance at all times. With all the machine's energy being used to separate the materials, there's no need for secondary building structures and supports. Many Ty-Rock screens rest in operating position by their own weight without any bolted attachments.

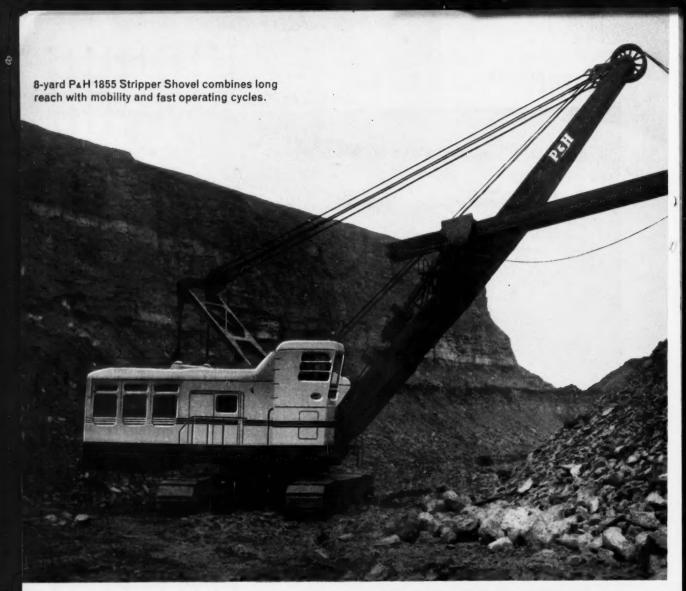
Ask your Tyler representative to give you full information—and recommend equipment perfectly matched to your needs. That's Tyler Screening Service.

WOVEN WIRE SCREENS . SCREENING MACHINERY . TESTING SIEVE EQUIPMENT

The W. S. TYLER Company · Cleveland 14, Ohio

OFFICES: New York • Chicago • Boston • Philadelphia • Atlanta
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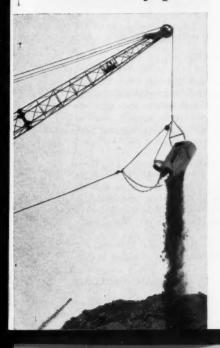


MAGNETORQUE® drive puts more material into the dipper-faster





with every pass



Because of Magnetorque Drive

P&H 1855 GETS UP TO 25% FASTER OPERATING CYCLES...

...outproduces any stripper shovel in its class

Prime reason for the faster stripping ability of the 1855 is Magnetorque drive—the most productive work-motion drive known for electric mining excavators. This advanced P&H drive electro-magnetically transmits the full power of an A.C. motor direct to hoist, swing and propel motions—without motor generator set conversion to D.C.

Results: Up to 30% higher bail pull, more uniform dipper speed in the bank with faster swing motion—important factors which produce up to 25% faster, well balanced operating cycles.

The 1855 is rated up to 8 cubic yards as a stripper shovel, with a choice of boom lengths up to 70 ft. and dipper handle lengths up to 56 ft.—all fabricated of ultra-high-strength T-1 steel. The machine is also fully convertible for long range dragline service. Unmatched for maneuverability, it is the largest excavator mounted on a single pair of crawlers.

The shovel crowd of this giant electric develops enormous thrusting power with rapid response, for it is powered by a D.C. motor driving the exclusive P&H multiple-thread hour-glass worm mechanism.

Harnischfeger is the only shovel manufacturer which makes its own electrical as well as mechanical components—all matched to work together and designed specifically for electric shovel service. Write Dept. 618A, Harnischfeger Corporation, Milwaukee 46, Wis.

HARNISCHFEGER

Milwaukee 46, Wisconsin





This V-Belt Drive costs less, takes shock loads chain couldn't handle!

Another manufacturing problem solved by the high capacity of Gates Super HC V-Belt Drives...

The makers of the Log Debarker shown above found that the chain drive on the debarker head could not always handle the shock loads characteristic of this operation.

To insure buyers of this machine top performance and freedom from down time, Machine Products Co. replaced the chain drive with Gates Super HC Drive.

Not only have they eliminated down time and replacement costs from shock-load breakage of the chain, the makers have also actually cut manufacturing costs because the Super HC Drive permits a smaller debarker head.

Nation-Wide Engineering Service

A Gates Distributor or Field Representative will show you how Super HC V-Belt Drives reduce sheave diameters 30% to 50%, reduce drive space up to 50%, and drive weight 20% and more. To learn more about Gates Drive Engineering Service ask him for a free copy of "The Modern Way to Design Multiple V-Belt Drives" or write the Gates Rubber Co., Sales Division, Inc., Denver, Colorado.

The Gates Rubber Company, Denver, Colorado

Gates Rubber of Canada Ltd., Brantford, Ontario



World's Largest Maker of V-Belts



TPA 475

Gates Super (NO V-Belt Drives in smaller "package"

Equipment News (Continued)

and 500-amp welders replace similar ratings in the firm's Challenger line and will be unveiled at the American Welding Society Exposition, April 25-27, Los Angeles.

Electrical System—"Porta-watt" is the name given to a new portable electrical distribution system introduced by the Tuffline Div., Whitney Blake Co., New Haven, Conn. The systems are primarily for use with portable gasoline-operated generators such as those used on trucks. The systems make it possible to operate flashing warning lights, flood- and trouble-lights, electric tools, blowers, heaters and many other electrical devices wherever the truck may be.

Free Bulletins

Idlers — Hewitt-Robbins, Inc., 666 Glenbrook Road, Stamford, Conn. Bulletin 171 describes construction, selection, dimensions and other data on basic idlers supplied by company.

Feeders — Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1. Booklet 2869 discusses and illustrates "MC Vibrating Feeders." Machines are compactly designed for feeding wide range of bulk materials.

Wire Rope — MacWhyte Co., Dept. PR, Kenosha, Wis. Catalog 6025 offers data on weights and strengths of improved Monarch Whyte Strand and Premium Whyte Strand. Improved plow steel is key feature of wire rope brands.

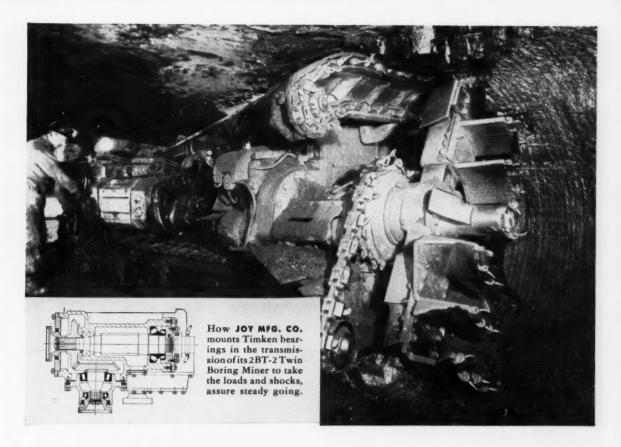
Tractors — Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. Catalog, 12 pp, covers "D" series utility tractor line with matched equipment.

Engines — Caterpillar Tractor Co., Peoria, Ill. "Some Facts of Engine Life," a booklet outlining steps to minimize downtime on engines, stresses use of manufacturers' parts.

Switches — Joy Mfg. Co., Electrical Products Div., 1201 Macklind Ave., St. Louis 10. Bulletin describes nine new pendent switches for electric hoist control. Switches feature safety and minimum maintenance, are rubber-encased.

Flocculant—Dow Chemical Co., Dowel Div., 1918 Highway 41 N., Evansville, Ind. Folder describes qualities and uses of Separan AP30, new synthetic highmolecular weight, anionic polymer for flocculating coal and clay-like slimes.

Diesel — International Harvester Co., 180 N. Michigan Ave., Chicago 1. Cata-



40-ton twin borer mines 8 tons per minute ... Timken bearings take the shocks

T mines 8 tons of coal per minute in a 7 foot seam. Yet this giant 40-ton Joy Twin Borer does a smooth, economical job with 73 Timken® tapered roller bearings to take the heavy shocks and twisting loads. Timken bearings are used at these vital points: main transmission and primary reducer unit.

Here's how Timken bearings assure trouble-free operation and long life with minimum maintenance for users of this Joy Twin Borer.

1) The tapered design of Timken

bearings lets them take radial and thrust loads in any combination.

2) Full line contact between rollers and races gives Timken bearings extra load-carrying capacity. And rollers and races are case-carburized to have hard, wear-resistant surfaces over tough, shock-resistant cores.

3) Timken bearings are made of the finest bearing-quality alloy steel available.

4) By holding shafts concentric with housings, Timken bearings make closures more effective in keeping dirt out, lubricant in, maintenance down.

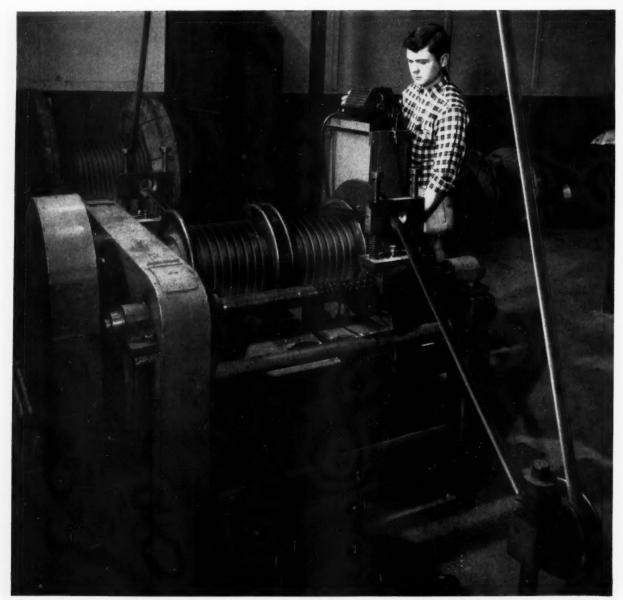
To get or build better machines, make sure they're equipped with Timken tapered roller bearings. When you buy Timken bearings you get ...

- 1) Quality you can take for granted.
- 2) Service you can't get anywhere else.
- 3) The best-known name in bearings.
- 4) Pace setter in lower bearing costs. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.



BETTER-NESS rolls on

tapered roller bearings



Accelerated testing of cable. This machine, designed by AS&W engineers, is testing mining machine cable to determine its resistance to reeling and pay off under tension, abrasion, flexing under tension, kinking under tension. Just one of the ways to determine the best insulating and jacketing compounds.

From portable tools to the largest power shovels, Amerciad Cables offer safe dependable service.

It's how you mix ingredients in just the right proportions that makes a big difference in cable performance.





Tiger Brand Electrical Wire & Cable

A standard cable for every special job

- . Asbestos Wire and Cable
- Mold-Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- · Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

What's the **difference** in electrical cable?

In Uss Tiger Brand Amerciad it's better engineering and quality construction

Engineered for the job. USS Tiger Brand Amerclad Cables are used in such a variety of applications that "engineering for the job" becomes extremely important. Special constructions are designed for electric shovels, dredges, mining machines, welders and portable tools. Cable life depends on how well the engineers have anticipated all the destructive forces that a cable encounters in service.

Quality construction. USS Amerclad's highly flexible construction—rubber insulated conductors and Amerprene jacket—is carefully designed to give you superior electrical performance and mechanical reliability. Dynamically balanced rope lay conductors, as opposed to loosely bunched groups of fine wires, give balanced performance and long, trouble-free service through elimination of unequal tension and elongation.

Each conductor is separately insulated with Amerite, a tough heat-resisting, special rubber compound that exceeds the requirements of ASTM, and other industry standards. A rugged abrasion resisting Amerprene jacket protects the cable from mechanical abuse.

Tiger Brand Amerclad Cables are as tough as they come. They soak up shock and vibration, withstand crushing impact, severe jerking and pulling for unbelievably long periods. Used outdoors for mining, quarrying and excavating machines, Amerclad resists the constant wear and abuse from contact with rocky

ground. And installed on lighter indoor equipment—electric welders, shop tools and motor leads—Amerclad gives top performance even when it's dragged over rough floors, through oil, grease or water.

Amerclad's greater durability will pay for itself many times in unfailing service, and ability to handle rated loads. It's the toughest electrical cord and cable money can buy.

Send for catalog. The Tiger Brand Amerclad Cable story is told completely in our new book we've reserved for you. We'll send the book without cost or obligation. American Steel & Wire, Dept. 0193, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

USS, Amerclad, Amerite, Amerprene and Tiger Brand are registered trademarks



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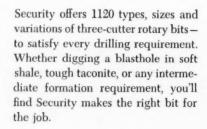








Drilling Job!



Available with regular air or jet-air circulations, with special air-bleed holes to bit bearings for maximum life. For faster penetration, rugged durability, and real economy - drill with Security.











Write for Catalog!



REAMERS . HOLE OPENERS STABILIZERS . CASING SCRAPERS INC.

DIL . GAS CHEMICAL MINING INDUSTRIAL

SECURITY ENGINEERING DIVISION . . . 3400 W. Illinois, Dallas, Texas EXPORT OFFICE... Post Office Box 13647, Dallas, Texas CANADA...Security Engineering Canadg, Ltd., Edmonton, Alberta, Canada OVERSEAS...Security International C. A., Caracos, Venezuela; London, England SECURITY PLANTS . . . Dallas, Texas; Whittier, California; Manchester, England

Equipment News (Continued)

log CR-607-I deals with the UDT-817 diesel engine, most powerful unit of its type built by the company.

Infrared-Fostoria Corp., Huntingdon Valley, Pa. Bulletin provides data on infrared heating, principles, advantages, applications and typical standard sys-

Accumulators-Parker-Hannifin Corp., Parker Hydraulics Div., 17325 Euclid Ave., Cleveland 12. Bulletin 1530B1 presents accumulators and uses in wide variety of hydraulic systems. Descriptions and technical data on piston-type line

Torches-Arcair Co., Lancaster, Ohio. Company invites firms using or contemplating use of Arcair equipment to register for "Arcair News," to be published quarterly. Issues will cover information on use of Arcair products.

Bolts-H. K. Porter Co., Inc., Connors Steel Div., 5000 Powell Ave., Birmingham, Ala. Folder available on complete line of "West Virginia" brand mine roof bolts.

Electrical Items - I-T-E Circuit Breaker Co., 1900 Hamilton St., Philadelphia 30. Speedfax catalog, featuring improved readability, covers firm's standard and engineered products.

Charging-The Electric Storage Battery Co., Exide Industrial Div., Rising Sun and Adams Ave., Philadelphia 20. Form 5092 discusses installation and use of new MP-3 charge control unit for simplifying battery charging.

Earthmoving-Caterpillar Tractor Co., Peoria, Ill. Reference catalog D942 treats complete line of firm's earthmoving equipment.

Circuit Tester-Schroeder Bros. Corp., Box 72, Nichol Ave., McKees Rocks, Pa. Four-page bulletin describes means and methods for using portable hydraulic circuit tester.

Lubrication-Eaton Mfg. Co., Farval Div., 3300 E. 80th St., Cleveland 4. Brochure No. 26-T contains information on complete line of centralized systems of lubrication.

Shovels-Thew-Shovel Co., Lorain, Ohio. Booklet covers details of construction and function of 21/2-yd Model L85A power shovel, available as crane, clam or dragline.

Rams-Duff-Norton Co., Box 1889, Pittsburgh 30. Advantages of using new Ram-Pac line of hydraulic rams and inT-WEDGE KLEENSLOT



A new concept in guard bar design. T-shaped wire replaces typical "bar" to increase screening surface while keeping large unscreenable lumps of material above the tolerance governing lower screening surface.

F217 and F250 KLEENSLOT



Manufactured with large size wedge shaped wires to maintain maximum efficiency over an extended period in abrasive applications.

Although large in wire size, this screen will easily maintain openings as close as 1 m.m.

G187 and GB187 MIGH-TEE KLEENSLOT



Special profile increases wearing surface. This is a heavy duty precision type screen that will easily maintain openings smaller than ½ m.m. and openings larger than ordinarily considered economical.

"S" KLEENSLOT



Engineered for applications where screening out of flats or slivers is of prime consideration. Can be also furnished in a "C" bend. Recommended for applications requiring openings larger than 1 m.m. For smaller openings, see Marcel screen.

MARCEL



This screen, while screening out "slivers," presents a flat surface for materials to wipe the opening clean. Available with openings up to 1 m.m.—for larger openings see "S" screens.

SCREEN GUARD



Vertical guard bars keep larger unscreenable materials above the actual screening surface. This increases screen life and promotes much greater efficiency in dewatering.

TAPER-SLOT

From loop to loop, the screen opening gradually increases. This design is to eliminate blinding when screening large amounts of near-opening size materials.



For example: .016 opening tapered to .024—the combination of opening sizes would be the same between each loop throughout the entire screen.

WEDGE-WIRE

Kleenslot

PREPARATION SCREENS

designed for vibrators or stationary applications for dewatering, screening, washing, extracting, filtering or sizing applications.

Wedge-Wire Kleenslot Screens are custom manufactured to your application and are available in many sizes, metals and finishes. Our engineering staff will assist you capably and promptly in obtaining the proper screen for highest production at lowest cost.



WEDGE-WIRE CORPORATION Wellington, Ohio

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mining-oil-abrasives-foods-chemicals-cements-phosphates
SCREENS FOR INDUSTRY

If coal is your cargo DODGE IS YOUR TRUCK

You'll find new Dodge Cab-Forwards ideally suited to hauling coal . . . for many reasons.

First, famous "Job-Rating" makes sure you get the right truck. You never pay for more truck than you need, yet you get enough to do your job. Second, Dodge gives you complete maneuverability, thanks to compact 89¾" BBC and tight turning diameters. Third, these husky coal-movers provide engine access heretofore impossible in trucks of this type. Exclusive Servi-Swing fenders open at the pull of a latch, exposing the engine for quick servicing.

Want more reasons? Check these: thrifty new Dodge V-8's and Cummins diesels; tough heat-treated frames; rugged 4-, 5-, 8- and 10-speed transmissions; new 5-way cab ventilation; aluminized mufflers; big choice of models from 15,000 to 53,000 lbs. G.V.W. Still more reasons? See your Dodge dealer! Discover first-hand why new Dodge Cab-Forwards are the finest trucks ever to carry a cargo of coal!



1960 DODGE ENGINES for Cab-Forward models include new gas V-8's from 178 to 228 hp., new Cummins diesels from 175 to 220 hp.



SERVI-SWING FENDERS open wide on sturdy hinges to give your mechanic easy access to most any part of the engine. Labor charges are lower, down-time is minimized.



CONVENTIONAL MODELS combine traditional Dodge dependability with modern performance, comfort, ride and looks. Money-saving models from 4,250 to 25,000 lbs. G.V.W.





A PRODUCT OF CHRYSLER CORPORATION,

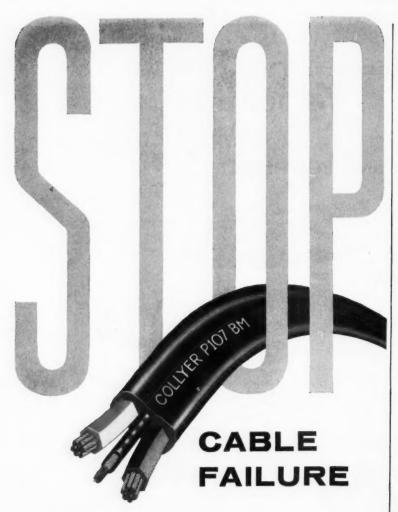
ARLIN-ROCKWELL RELIABILITY COUNTS

IN MECHANIZED MINING EQUIPMENT



MARLIN-ROCKWELL CORPORATION
JAMESTOWN, NEW YORK

BALL AND ROLLER bearings



Put the "hex" on off-track mining machine down time with the new Collyer Twin Type G Portable Power Cable with hex-shaped parallel conductors. This construction locks conductor assemblies in place, prevents twisting and shifting, assures longer flexing life . . . AND LONGER CABLE LIFE!

Insulated with heat-resistant natural rubber . . . sheathed with Collyer's tougher, more durable Neoprene sheath compound to give greater resistance to abrasion, tearing, crushing. Compression cutting is "hexed", too, by natural rubber insulation!

Write today for complete information on how this new cable can put a stop to resplicing down-time and replacement overhead.

COLLYER INSULATED WIRE CO.

257 ROOSEVELT AVENUE
PAWTUCKET, RHODE ISLAND

Equipment News (Continued)

dependent pumps are included in this bulletin. No. AD-90. Capacities run from 10 to 100 tons.

Pumps-Milton Roy Co., 1300 E. Mermaid Lane, Philadelphia 18. Bulletin 1153-c gives complete details and illustrations of Mersemetric pump requiring no openings in tank except one at top.

Compressor-Westinghouse Air Bake, Le Roi Div., Milwaukee 1. Twenty-two features of Le Roi Model 125RG2 portable rotary compressor.

Generators-D. W. Onan & Sons, Inc., Minneapolis 14. Folder lists entire line of gasoline engine-driven electric generating plants.

Roller Chains - Dodge Mfg. Corp., Mishawaka, Ind. Bulletin, 56 pp, discusses firm's line of roller chain and Taper-Lock sprockets. Includes selection data and prices.

Panels-Johns-Manville Corp., 22 E. 40th St., New York 16. Folder IN-229A describes asbestos-cement materials for electrical panel boards, low voltage applications.

Compressor-Davey Compressor Co., Kent, Ohio. Description and operating principles are included in Form 263. which provides data on 600 RP rotary compressor. Emphasis is placed upon patented "Perma-Vane" blades, reputed to eliminate delamination and breakage.

Full Line-International Harvester Co., 180 Michigan Ave., Chicago 1. A 24-p folder describes in brief the full line of I-H construction equipment. Booklet includes numerous illustrations, diagrams and charts.

Idler - Joy Mfg. Co., Pittsburgh 22. Write to receive Bulletin LD-111, on Joy's Series 200 Limberroller belt conveyor idler, an improved version of the original two-bearing caternary idler, introduced by the firm in 1953. Idler consists of a series of neoprene discs molded to a neoprene-covered flexiblesteel wire cable suspended from two end-mounted bearings.

Collectors-Link-Belt Co., Chicago 1. "Circuline Sludge Collectors," Book 2546, presents firm's complete line of six series and 15 types of Circuline collectors for waste treatment settling tanks.

Shaker - Allis-Chalmers Mfg. Co., Milwaukee 1-Advantages of the firm's 31/2-ton car shaker for fast, safe economical pushbutton unloading of granular material from open, hopper-bottom gondola cars are discussed in Leaflet 26B9438, Machine is recommended where 5-ton units are not applicable.

THE DUTCH STATE MINES HEAVY MEDIUM CYCLONE WASHER

Available in the United States exclusively from

ROBERTS & SCHAEFER

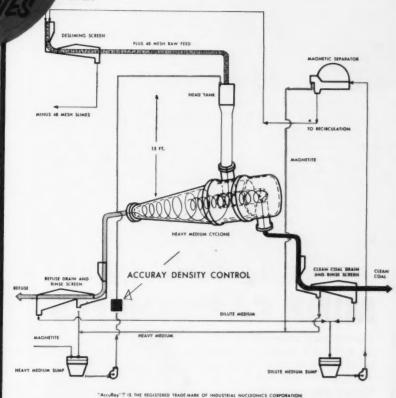
FLOW DIAGRAM OF HEAVY MEDIUM CYCLONE WASHING SYSTEM

If you are facing the necessity of upgrading the quality of your fine coal to meet the exacting requirements of today's market, you can install the Dutch State Mines Heavy Medium Cyclone Washing System with complete confidence.

It is the only cyclone washing system proved sound, practical and efficient by successfully operating plants in many countries. It is the only system that gives you the advantages of the technical knowledge and experience of the Dutch State Mines engineering organization.

The Roberts & Schaefer technical staff handles all details of engineering and construction of Heavy Medium Cyclone Washing Plants . . . with the continuing collaboration of the Dutch State Mines engineers on installations in United States.

The Dutch State Mines Heavy Medium Cyclone Washer is available in the United States exclusively from Roberts & Schaefer. Call or write us for detailed information.



A Personal Invitation to Visit Our New Offices

During recent weeks we have had the pleasure of welcoming many of our friends in our new general offices in Chicago. Here at 201 North Wells Street, our executive staff and engineering organization now have greatly expanded space and the most modern facilities to serve the coal mining industry. When you are in Chicago, do come in and visit with us.

WILLIAM C. McCulloch President

ENGINEERS & CONTRACTORS



201 NORTH WELLS STREET, CHICAGO 6. ILLINOIS

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DIVISION OF THOMPSON-STARRETT COMPANY, INC.

Among the Manufacturers



The Hulburt Oil & Grease Co. announces that W. Stuart Emmons was elected president at a recent meeting of its board of directors. Mr. Emmons, formerly executive vice president, has been associated with Hulburt since 1940. During this period, he worked in all phases of this mine lubrication company. He helped spearhead Hulburt's comprehensive research program and, in addition, played an important role

in the expansion of the company's sales efforts. Mr. Emmons is personally well known throughout the coal mining industry, both in and around the mines, as well as at the management level. His work often takes him underground to discuss and work out lubricating problems, a procedure that has long been associated with Hulburt sales personnel. Mr. Emmons graduated from Princeton University and then, while attending the Harvard Graduate School of Business Administration, volunteered for service in the U.S. Navy during World War II. After four years' service in the Navy he returned to Hulburt and has been actively associated with them since that time.

The Long Co., Oak Hill, W. Va., a leading manufacturer of underground mining equipment, has been acquired by Marmon-Herrington Co., Inc., Indianapolis, Ind. Marmon-Herrington already is active in the mining field, owning the Airdox Co., Chicago, Ill., whose principal product is a non-explosive method of breaking coal.

The Long Co. and Airdox Co. will be operated jointly under the name of Long-Airdox Co. John B. Long, president

of the acquired firm, will be president and chief executive of the new Long-Airdox Div., and will be a vice president of Marmon-Herrington as well as a director.

The Long Co., one of the few manufacturers supplying completely integrated systems of underground mining, has operations in Oak Hill and Scarboro, W. Va. Airdox Co. has offices in Chicago with its manufacturing plants, warehouses and district offices located in Harper, W. Va., Benton, Ill., St. Clairsville, Ohio, Pikesville, Ky., Louisville, Colo., Finleyville, Pa., Ottumwa, Iowa, Camden-on-Gauley, W. Va., and Evansville, Ind.

Discussing the acquisition, Marmon-Herrington said that with Long and Airdox products supplementing each other, strong sales, research, manufacturing, field service and engineering staffs of the combined firms will offer a complete line of mining machinery designed to produce coal of better quality and more efficiently at the lowest possible cost. The acquisition involved cash and stock, but the price was not disclosed.



Mr. Long

J. B. Long, 41, has been president of the Long Co. since 1946, during which period the company has grown from 5 to 180 employees. He attended Hampden-Sydney College and graduated from the University of North Carolina. Following graduation in 1938, he joined his father in the firm. As president, he has been active in machinery design and development as well as application. He is married to the former Miss Katherine Wicker, Richmond, Va., and has 4 children. He is a member of the AIME and a director of the Bank of Mount Hope, W. Va., Ramsey Products Co., Charlotte, N.C., and Cedar Creek Mining Co., Oak Hill, W. Va.

John P. Kingman has joined the staff of Rockbestos Wire & Cable Co., Div. of

QCf Load-support MINE CAR WHEELS

Quick-chilling after casting gives QCf Chilled Tread Car Wheels extra resistance to abrasion and wear, gives you real economy through long service life. Gray iron center costs less to mount, reduces vibration and effects of stress concentration. Curved plates support tread at load center: minimize damage to treads.



Cross Section of **QCf** "Load Support" Mine Car Wheel showing: (1) uniform depth of hardening, (2) extra heavy overhang, (3) support at center of tread.

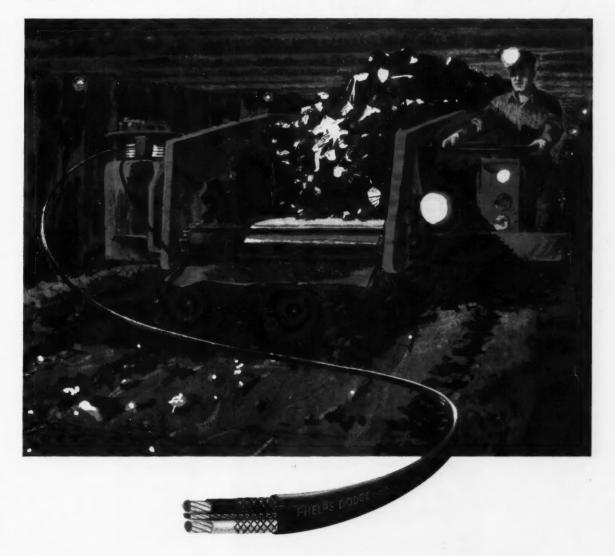


For further information, just ask your QCf representative.

AMERICAN CAR AND FOUNDRY
DIVISION OF ACT INDUSTRIES, INCORPORATED
750 THIRD AVE., NEW YORK 17, N. Y.

Sales Offices: New York • Chicago • St. Louis • Cleveland • Washington • Philadelphia • San Francisco Berwick, Pa. • Huntington, W. Va. • Plants: Berwick, Pa. • Huntington, W. Va. • St. Louis, Mo.

SELECT THE CABLE MADE BY THE FAMOUS "MINE-TO-MARKET" FAMILY ...



Phelps Dodge Mining Cable

- Made of highest quality copper from Phelps Dodge's own open-pit mines.
- Combines years of Phelps Dodge mining "know-how" with many years of cable manufacturing experience to give you the finest quality cable you can specify.
- Assures utmost protection against damage from mechanical and electrical hazards in both above and below ground mining operations.
- Listed by the U. S. Bureau of Mines, and approved by the Department of Mines, Commonwealth of Pennsylvania, P-114-BM.

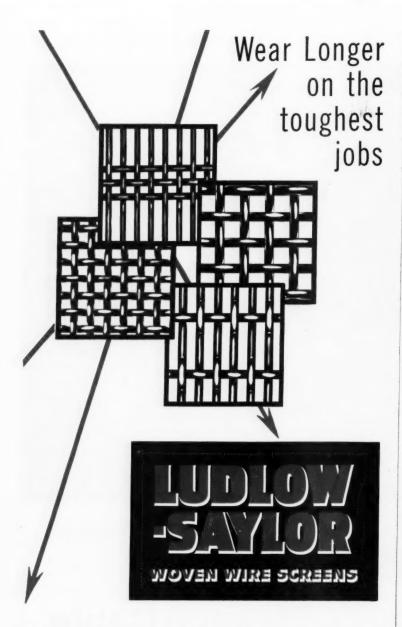
First for Lasting Quality-from Mine to Market!

PHELPS DODGE COPPER PRODUCTS

CORPORATION

300 Park Avenue, New York 22, N. Y.





Wire especially alloyed for super hardness and ductility guarantee extreme resistance to abrasion and fatigue...tighter, more rigid weaving plus machine leveling insure flatness and retain accuracy of openings... precision-applied hook strips permit installation under higher tension to prevent buckling, distortion and breaking.

Be specific when you order—specify L-S Screens by name. They cost no more than ordinary screens but give up to twice as much service. Write for Condensed Screen Reference Catalog.

IMMEDIATE SHIPMENT-most weaves and sizes

Ludlow-Saylor Screens and Wire Cloth can be furnished in any steel including SUPERLOY high carbon, LUDLOY oil-tempered, stainless or other alloys; Monel, bronze, copper, brass or any metal that can be drawn into wire.

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Manufacturers (Continued)

Cerro de Pasco Corp., New Haven, Conn., as government representative with headquarters in Washington, D. C. He comes to Rockbestos with a background in electrical engineering from Rensselaer Polytechnic Institute and sales experience in the Wire & Cable Div., United States Rubber Co. Mr. Kingman lives in Falls Church, Va., with his wife and their 2 children. His hobbies include electronics, gardening and photography.

Richard R. Taylor has been named chief engineer of Fairmont Machinery



Mr. Taylor

Co., Fairmont, W. Va., succeeding M. A. Baret who has been appointed engineering assistant to the president. A native of Lincoln, Neb., and a graduate of Illinois Institute of Technology, Mr. Tay-

lor comes to Fairmont from Barber-Greene Co., and Link-Belt Co., where he was employed in sales engineering on coal preparation and material handling equipment. He is a member of the ASME and is vice president of the Salt Creek, Ill., chapter of professional engineers.

Harold S. Mercier, formerly general sales manager, The Tool Steel Gear &



Mr. Mercier

Pinion Co., Cincinnati, Ohio, has been named to the post of vice president in charge of sales. Mr. Mercier has been associated with Tool Steel for the past 7 yr, occupying the position of general

sales manager for the last 5 yr. Succeeding Mr. Mercier as general sales manager will be R. L. McGrath, formerly assistant general sales manager. Tool Steel Gear & Pinion Co. manufactures hardened steel products for practically every major industry.

Joy Mfg. Co.'s George A. Ward, district manager, Coal Machinery Div., Denver, Colo., has retired and Joseph E. Ward, previously district manager at the division's Luzerne, Pa., office, will replace him. T. Clyde Esler, formerly a Coal Div. Pittsburgh representative, will become district manager, Luzerne. Also, Timothy C. Woomer has been named as sales representative in southern Illinois for the Coal Div.'s St. Louis Dist. office. Anthony Jerasonek, formerly rock-drill representative, Huntington, W. Va., becomes sales representative, St. Louis

office, covering western Kentucky and southern Indiana.

Karl Kelly, who has managed the Buffalo, N. Y., district office of I-T-E



Mr. Kelly

Circuit Breaker
Co. for the last 2
yr, has been selected as manager
of the Pittsburgh
district sales office.
He succeeds B.
W. Blose, on
leave of absence.
The Pittsburgh
office handles sales
of 1-T-E equip-

ment in western Pennsylvania, northern West Virginia, northwestern Maryland and eastern Ohio. Mr. Kelly, a graduate of Drexel Institute of Technology, with a degree in electrical engineering, joined the company in 1950 as a field engineer. Prior to that he served as an engineer for General Electric Co., and Elpeco Co.

Adrien F. Busick Jr., formerly executive vice president and general manager, Marion Power Shovel Co., division of Universal Marion Corp., has been named president and general manager of the division. David Reich was appointed assistant to the president of the parent, Universal Marion.

E. J. Mytkowicz takes over the new position of vice president in charge of operations of the Hewitt Rubber Div., Hewitt-Robins, Inc.

J. E. Fink is manager, screening machinery, and M. P. Hahn, supervisory engineer, product engineering, for the reorganized Processing Machinery Dept., of Allis-Chalmers Co.

Kenneth A. Willig has been appointed national sales manager for a newlyformed Small Excavator Div., at Harnischfeger Corp.

Richard L. Appling Bluefield W. Va., has been named sales representative, West Virginia, North Carolina and parts of Virginia, Kentucky and Tennessee, for Victaulic Co. of America.

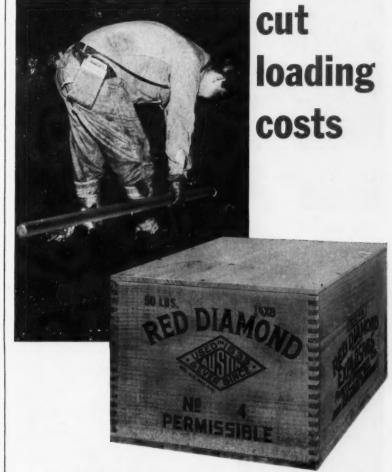
Max E. Colson is the new vice president in charge of the Explosives Div., for Atlas Powder Co.

Jerry McEvilly has been appointed field representative for the Arcair Co., in the Chicago area.

H. K. Porter Co., Inc., announced it had appointed Fred W. Elliott, James A. Drain, Emmett H. Mann and B. Campbell Blake vice presidents.

J. Walter Snavely has been appointed assistant district sales manager, Milwaukee Dist., for Chain Belt Co.

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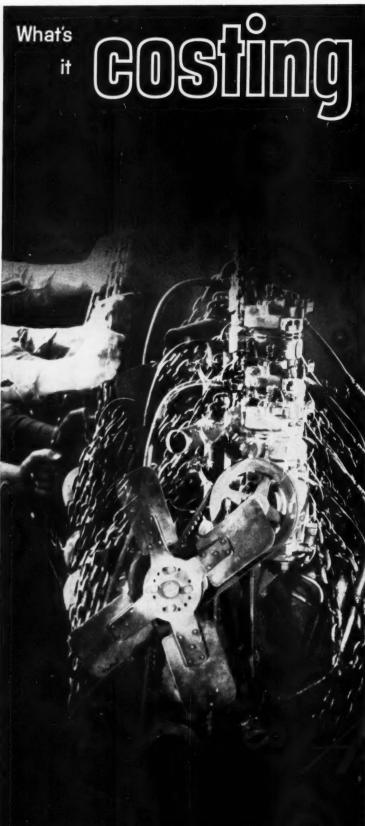
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2-4JCM Joy Continuous Miners, 440 Volts A.C.
1-10RU Joy Cutting Machine, 220/440 Volts 1-512 Goodman Cutting Machine, 220/440

olts A.C. B Sullivan Cutting Machines, 220/440 3-78 Silven Cutting Machines, 220/440 Yolts A.C. 1-88U Joy Loading Machine, 220 Volt AC, 31' high, equipped with stub boom for PI-12 Piggyback 1-1-1 Joy Machine Truck, AC. 1-72-5 Joy Machine Truck, AC.

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1-18 HR Joy Loading Machine, 250 Volts D.C.
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1-11 BU-11APE Joy Loading Machine, 250 2—14 BU-7BE Joy Loading Machines, 250 Volts

BU-3PE Jay Loading Machines, 250 Volts D.C. 6—12 BU-9E Joy Loading Machines, 250 Volts

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3-8 BU Joy Loading Machines, 250 Volts D.C.
3-7 BU Joy Loading Machines, 250 Volts D.C.
2-Long 12" Pigypback Conveyors, each 300'
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75 H.P. Main Motor, Serial No. 5803.

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1-10RU Joy Cutting Machines, Permissible, 230 Volts D.C.
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5-338 Jeffrey Cutting Machines, 250 Volts D.C.
6-338B Jeffrey Cutting Machines, 250 Volts D.C.

D.C. 1-35 LC Jeffrey Cutting Machines, 35 H.P. 2-29LC Jeffrey Cutting Machines, 250 Volt D.C. 2-512 EJH Geodman Cutting Machines 2-512DA Goodman Cutting Machines, 250

Volts D.C. 2—7AU Sullivan Cutting Machines, 250 Volts

3-212 AB Goodman Machines. 2-412 AA Goodman Machines. 1-35L Jeffrey Machine 35 H.P.

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3-4JCM Jey Continuous Miners, 440 Volts A.C.

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1-130 KW Westinghouse Rotary Converter, Pedestal Type, 1200 RPM, 2300/4000 Volts Primary, 275 Volts DC.
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Drills, 3 phase, 220 Volt AC Permissible.

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1-36" x 36" Double Roll Crusher, complete with 100 H.P. Motor.

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LOCOMOTIVES FOR SALE
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1-MH-150 Jeffrey Locomotive, 42" track gauge,
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1-MH-88 Jeffrey Locomotive, 30" high with
CY-21 Reel, 44" track gauge.
1-General Electric 6 Ton Locomotive with Reel,
36" gauge.
1-1030 Goodman Locomotive, 24" high, 44"
track gauge.

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1-MSA Track Mounted Rock Duster, 10 H.P.,
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1-American Mine Door, Wheel mounted bantam type rock duster, 250 Volts D.C., 22"
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DIESEL PLANTS FOR SALE

1-60 KW, G.M. Diesel Generator Set, with
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Wound. Complete with D.C. panel and switch gear.

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-Joy 10RU Rubber tired Cutters, Universal head, 220/440 V. AC. Perfect.

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Joy 14BU 3PE Loaders.

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-Joy 208U Loader, latest type.
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Jeffrey 15 ton MH-77 Locomotive, armor plate frame.

Jeffrey, 13 ton, type MH-110, 36°, 42°, 44° ga.

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4—Jeffrey 8 ton, type MH-100 2½" armor plate frames.

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1—6.E., 8 ton, type 822 Locomotive, 44" ga.

3—G.E., 10 ton, type 809 Locomotives, 42", 44" and 48" ga.

2—Goodman, type 33, 6 ton, 44" and 48" ga.

3—Westinghouse, type 902, 4 ton, 42" and 48" ga.

2—Westinghouse, type 904, 6 ton, 44" and 48" ga.

2—Westinghouse, type 904, 6 ton, 44" and 48" ga.

3—Westinghouse, type 905, 10 ton, 44" and 48" ga.

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2—Complete Tipples, 3 & 5 track, steel and wood.

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2—Monoltor Lines complete with Drums, excellent.

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1—Allis-Chalmers 6' x 12' Rippflo Vibrator.

1—Robins Gyrex Vibrator, 4 x 10.

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1—Robins Car Shakeout.

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4—Mine Scales, 10 & 20 ton.

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Feeders, Belt and Drag Conweyors, Car Retarders, etc.

CUTTING MACHINES

CUTTING MACHINES

2—Joy 10RU rubber tired Cutters, Universal Head, 220/440 volt AC. Perfect

4—Joy 10RU rubber tired Cutters, Universal Head, 250 V. DC.

1—Joy 11RU, rubber tired Cutter, 250 V. DC.

1—Goodman rubber tired Cutter, new 1956. Excellent.

1—Goodman 2410 rubber tired Cutter Universal, Head, like new.

2—Jeffrey 29UC Universal Machines on Crawlers.

1—Goodman 01C aviversal Machines, 19° high.

4—Goodman 312 Cutting Machines, 19° high.

4—Goodman 312 Cutting Machines, 19° high.

4—Goodman 312 Cutting Machines, 19° high.

5—Goodman 512's, with Bugdusters, like new.

4—Goodman 512's, rebuilt, or as removed from service.

4—Goodman 512's, rebuilt, or as removed from service.
6—Goodman 112's, 220'440 V. AC.
1—Joy 7-B Cutting Machine. 250 V. DC.
1—Joy 7-B Cutting Machines, rebuilt, 35 & 50 H.P.
6—Joy 11B Cutting Machines, rebuilt, 35 & 50 H.P.
10—Goodman 12AA's and 112AA's, 250 V. DC.
2—Goodman 324 Slabbers.
2—Goodman 324 Slabbers.
2—Goodman 824 Slabbers.
5—Jeffrey 35L's, like new, 17" high.
2—Jeffrey 35L's, like new, 17" high.
2—Jeffrey 35L's, and 35BB's.
15—Jeffrey 35B's and 35BB's.
15—Jeffrey 29B's on track.
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*Indicates more product information may be found in company advertising appearing in COAL AGE 1959 July Mining Guidebook and Buying Directory Issue. Check your Guidebook index.

*Allegheny Ludlum Steel Corp	Hewitt-Robins 58 *Heyl & Patterson Inc. 14 *Hoyt Wire Cloth Co. 12
Foundry Div Third Cover, 200 *American Biltrite Rubber Co. Boston Woven Hose & Rubber Div 53	*International Harvester Co 60-61
*American Cyanamid Co	*Jeffrey Manufacturing Co 123, 124
American Brake Shoe Co 24	Jones & Laughlin Steel Corp 88-89
*American Oil Co 125	*Joy Manufacturing Co 50, 184-185
*American Pulverizer Co 78	*V
*American Steel & Wire Div.	*Kennametal Inc 51
United States Steel Corp 192-193	*KW-Dart Truck Co
Armstrong-Bray & Co 56	*KW-Dart Truck Co 59
Ashland Oil Co 211	Lecco Machinery & Engineering
*Atlas Powder Co 43	Co Second Cover
Austin Powder Co 203	*Lee-Norse Co 48-49
*Bathlaham Steel Co 10 140 162 175	*LeRoi Div. Westinghouse Air Brake Co. 106
*Bethlehem Steel Co 19, 149, 162, 175 *Bird Machine Co	*LeTourneau-Westinghouse Co 103, 105
*Bowdil Co	*Lima Works, Construction Equipment Div. Baldwin-Lima-Hamilton Corp 91
*Bucyrus Erie Co	*Link-Belt Co Fourth Cover
	Long-Airdox Co. Div. of
*Carrier Conveyor Div. Chain Belt Co 170	Marmon-Herrington Co 145
*Caterpillar Tractor Co 8, 39, 147, 212	*Ludlow-Saylor Wire Cloth Co 202
*Cincinnati Mine Machinery Co 63	*Lukens Steel Co 128
Cleveland Wire Cloth Co 66	
*Collyer Insulated Wire Co 198	Macwhyte Co
*Combustion Engineering Inc 144	*Manhattan Rubber Div. Raybestos-Manhattan Inc 87
*Cross Perforated Metal Plant, National Standard Co	*Manitowoc Engineering Co 172-173
Transport Contract Co	Marlin-Rockwell Corp 197
Detroit Diesel Engine Div. General	*McLanahan & Stone Corp 182
Motors	*McNally Pittsburg Manufacturing
*Dodge Div. Chrysler Corp	Co
Dodge Manufacturing Co. 68-69 *Dorr-Oliver Inc. 150-151	Metallurgical Products Div. General
*du_Pont de Nemours & Co. E.I.	Electric Co 54, 55
Explosives Div 179	*Mine Safety Appliances Co 129
	Mine & Smelter Supply Co 18
Eaton Manufacturing Co	*National Mine Service Co 47, 143
Ensign-Bickford Co	Nolan Co
Euclid Div. General Motors 85	1044 00
*Federal Mogul Service Div.	*Ohio Brass Co 62, 67, 186
Federal-Mogul-Bower Bearings Inc 57	*Okonite Co
*Femco Inc 41	
Firestone Tire & Rubber Co	Pattin Manufacturing Co 32
Flexible Steel Lacing Co	Pennsylvania Crusher Div. Bath Iron Works Corp
Fuller Manufacturing Co	Phelps Dodge Copper Products Corp 201
a unci manufacturing Co	*PLM Products Inc 46
*Galis Electric & Machine Co 42	*Porter Co. Inc. H. K.
Gates Rubber Co	Thermoid Div
General Tire & Rubber Co 141	*Post-Glover Electric Co
*Goodman Manufacturing Co 31	Prox Co. Inc. Frank
Goodrich Aviation Products B.F 90	*Penublic Steel Corp. 156.157
*Goodrich Industrial Products Co. B.F 1	*Republic Steel Corp
*Goodrich Tire Co. Div. B. F. Goodrich	
Co	*John A. Roebling's Sons, Div. The Colorado Fuel & Iron Corp 6, 153
	*Salem Tool Co 2-3
*Harnischfeger Corp 188-189	Searchlight Section 205-209
*Hendrick Manufacturing Co 37	Security Engineering Div. Dresser Industries Inc
Hendrix Manufacturing Co 177	
*Hercules Powder Co	*Simplex Wire & Cable Co 183

*Spencer Chemical Co
*Stamler Corp. W. R 10
*Standard Oil Co. of Indiana 22-2
Stephens-Adamson Manufacturing Co. Engineering Div
*Sun Oil Co 18
*Templeton, Kenly & Co 8
*Texaco Inc 7
Timken Roller Bearing Co 19
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*Union Switch & Signal Div. Westinghouse Air Brake Co
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Wedge-Wire Corp
West Virginia Belt Sales 25
Wickwire Spencer Steel Div. Colorado Fuel & Iron Corp 164-165
*Wilfley & Sons Inc. A. R 10
•
PROFESSIONAL SERVICES 205
•
CLASSIFIED ADVERTISING F. J. Eberle, Business Mgr.
EMPLOYMENT OPPORTUNITIES 205 WANTED
EQUIPMENT
(Used or Surplus New For Sale) 205-209

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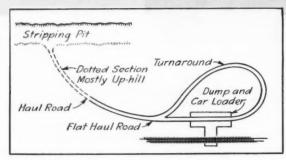


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One of three Cat DW20 Series G Tractors with PH20 Coal Haulers that help maintain high production at the Airline Mine, near Linton, Indiana



Owned by the Alva Coal Corporation, Jasonville, Indiana, the Airline Mine produces No. 5 coal. Three Caterpillar DW20 Series G Tractors with PH20 bottom dump wagons help haul the coal from pit to loader. As you can see by the sketch, much of the haul is uphill. Delivering 50 tons per load, each hauler averages 17-20 loads per shift, depending on the conditions of the haul road.

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On that adverse grade, as well as on the flat, the increased horsepower and rimpull of the DW20 Series G Tractors really pay off. Compared to the previous model, they deliver 12% higher rimpull, provide up to 20% faster travel speeds under similar haul road conditions. They can attain a top speed of 35 MPH.

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Caterpillar Tractor Co., General Offices, Peoria, Illinois, U.S.A.

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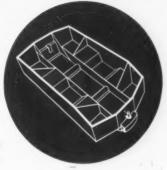
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4 wheel or 8 wheel



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4 wheel



ROTARY DUMP

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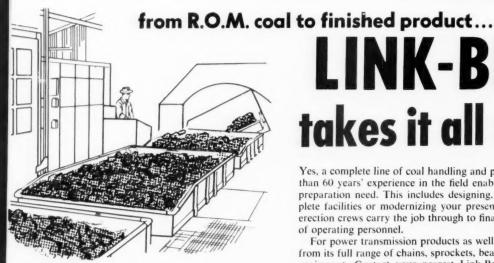
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DUMPING — Rotary mine car dumpers, car hauls, refuse car dumpers and feeders.

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Yes, a complete line of coal handling and processing equipment plus more than 60 years' experience in the field enables Link-Belt to fulfill any coal preparation need. This includes designing, fabricating and erecting complete facilities or modernizing your present installation. Our experienced erection crews carry the job through to final completion including training of operating personnel.

For power transmission products as well, Link-Belt can supply them all from its full range of chains, sprockets, bearings, speed reducers and other equipment. Contact your nearest Link-Belt office for full information. Or write for Book 2655 on Link-Belt equipment for coal preparation.



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DRYING — By drying quickly, safely and uniformly, Link-Belt coal dryers assure a highly marketable coal at a low cost



CLEANING: TANK-TYPE CON-CENTRATOR uses principle of float-sink separation in a mag-netite and water mixture. A drum-type is also available to



AIR-PULSATED WASH BOXES Single and double bed types to satisfy all capacities. Both with new, automatic refuse discharge control. Also Link-Belt trough separators.



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